EOSDIS Core System Project

Interface Control Document Between EOSDIS Core System (ECS) and the Earth Resources Observation System (EROS) Data Center (EDC)

August 1999

Raytheon Systems Company
Upper Marlboro, Maryland

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS Contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

This ICD contains information pertaining to EDC ancillary Digital Elevation Model (DEM) data and Landsat 7 Level 0 data ordering interfaces.

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Abstract

This Interface Control Document (ICD) defines the functional and physical design of each unique interface between ECS and the EDC, and includes the precise data contents and format for each interface. All modes (options) of data exchange for each interface are described as well as the conditions required for each mode or option and the typical data rates. The sequence of exchanges are completely described. Communications protocols are detailed for each interface.

This ICD is derived from the Operations Concept for Digital Elevation Model Data in ECS, and the B.0 Landsat-7 Billing and Accounting Workaround Interface Definition Document.

Keywords: EDC, ICD, Interface, Software, EOS, Science, Scientist, Computing, DEM, ASTER, digital, elevation, model, billing, accounting, DORRAN.

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1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirement List (CDRL) Item 029, whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Scope

This ICD defines the detailed design of interfaces between ECS and the EDC. These interfaces are for 1) ancillary Digital Elevation Model (DEM) data, and 2) the billing and accounting system at EDC (Distributed Ordering, Research, Reporting and Accounting Network [DORRAN]). These interfaces satisfy the requirements specified in Appendix A of this ICD.

Certain implementation details are not suitable for, or specified in, this document. Such items as contact address, telephone or fax numbers, internet host id's, values for operator tunable parameters such as number of retries on failure or timeouts should be documented in an Operations Agreement or Operations Procedures document under the control of the Distributed Active Archive Center (DAAC). The term "Operations Agreement(s)" in this document refers to such a document though the particular documentation name may vary from DAAC to DAAC.

This document does not include ECS Release or Drop schedules. Information about schedules for implementation of external interfaces is contained in the Science Data Processing System (SDPS) Program Schedule.

1.3 Purpose and Objectives

This document is written to formalize the interpretation of the interface between ECS and the EDC, for the DEM data and for the DORRAN system, to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system. This ICD also provides a control point for the definition of interfaces between ECS and the EDC.

1.4 Status and Schedule

This ICD is submitted to NASA as a Configuration Control Board (CCB) approval code 1 document. At the Government's option, this document may be placed under full Government CCB control. Changes may be submitted at any time for consideration by Contractor and Government CCBs as part of the normal change process.

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1.5 Organization

Section 1 introduces this document by providing its scope, purpose and objectives, ICD status and schedule, and document organization. It is arranged so that each interface is described in its own section, and future interfaces may be added with minimal impact.

Section 2 lists the parent documents to which the interfaces in this ICD trace, the referenced documents that are directly applicable to this document, and information documents that may amplify or clarify information contained herein.

Section 3 contains a description of the ancillary DEM interface, including the methods and protocols for data exchange, ECS ingest procedures, and file formats.

Section 4 contains a description of the ECS interface with EDC's DORRAN system, including the methods and protocols for data exchange, message formats, and ingest procedures.

Appendix A contains the requirements for the ECS-EDC interfaces.

Appendix B contains the metadata for 1-km resolution DEM data.

Appendix C contains the metadata for 100-m resolution DEM data.

Appendix D contains the pricing algorithm for Landsat-7 data at EDC.

The Abbreviations and Acronyms in Appendix AB define all abbreviations and acronyms that appear herein.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

193-208-SE1	Methodology for Definition of External Interfaces for the ECS Project
162-WP-003	Operations Concept for Digital Elevation Model Data in ECS
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
505-10-20	Goddard Space Flight Center, System Interface Control Plan for the Earth Science Data and Information System (ESDIS) Project
none	B.0 Landsat-7 Billing and Accounting Workaround Interface Definition Document (IDD)
none	B.0 Landsat-7 Billing and Accounting Workaround Memorandum of Understanding

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

311-CD-008	Release B Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
333-CD-100	SDP Toolkit Users Guide for the ECS Project
625-CD-516	SSI&T Training Manual
611-CD-500	The Mission Operation Procedures for the ECS Project
162-TD-001	Science Software I&T Operational Procedures for the ECS Project
170-TP-005	HDF-EOS Library Users Guide for the ECS Project, Vol. 1
170-TP-006	HDF-EOS Library User's Guide for the ECS Project, Vol. 2420-TP-016 Backus-Naur Format (BNF) Representation of the B.0 Earth Science Data Model
420-TP-015	B.0 Implementation Earth Science Data Model
none	Goddard Space Flight Center, ECS Technical Direction No. 11, "PDR Technical Baseline," 12/6/94

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

305-CD-500	Release 5A Segment/Design Specification for the ECS Project
313-CD-500	ECS Internal Interface Control Document for the ECS Project
194-815-SI4	SDP Toolkit Primer for the ECS Project [available in HTML only on the ECS Data Handling System @ http://edhs1.gsfc.nasa.gov/]
814-RD-009	HDF-EOS 2.0 Version Description Document for the ECS Project
814-RD-009	HDF-EOS 2.1 Version Description Document for the ECS Project
814-RD-101	HDF-EOS 2.3 Version Description Document for the ECS Project
814-RD-101	HDF-EOS 2.4 Version Description Document for the ECS Project
420-TD-069	ODL Restrictions, ECS Specific and ODL Library Specific
170-WP-002	Thoughts on HDF-EOS Metadata for the ECS Project
175-WP-001	HDF-EOS Primer for Version-1 EOSDIS
586-1ICD/0398	Interface Control Document Between the Level 1 Product Distribution System (LPDS) and the EOSDIS Core System (ECS)
505-41-30	Interface Control Document Between ECS and the Version 0 System for Interoperability
505-41-31	Interface Control Document Between EOSDIS Core System (ECS) and the NASA Science Internet (NSI)
505-41-17	Interface Requirements Document (IRD) between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and the NASA Science Internet (NSI)
505-42-01	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the NASA Science Internet (NSI) for Non-ECS EOSDIS Elements
CCSDS 641.0-B-l	Consultative Committee for Space Data Systems (CCSDS), Recommendation for Space Data System Standards: PVLSPEC - Parameter Value Language Specification, 5/92
ISO 7498	International Organization for Standardization, Basic Reference Model for Systems Interconnection
RFC 791	Postel, J.; Internet Protocol
RFC 793	Postel, J.; Transmission Control Protocol
RFC 821	Postel, J.; Simple Mail Transfer Protocol

3. Ancillary DEM Data

ECS has a requirement to supply storage for and access to Digital Elevation Model (DEM) data for instrument data processing and for access by authorized users. This data set includes ancillary products such as land/sea mask. The high level format and content of the data resolution, coverage, and variables was specified by the DEM access committee of the Investigators Working Group's (IWGs) Science Working Group for the AM1 Platform (SWAMP). (Please refer to the following URL for more information about SWAMP: http://eospso.gsfc.nasa.gov/directory/iwg/swamp.html).

3.1 Interface Overview

The ancillary DEM data will be stored in the Hierarchical Data Format (HDF), derived from binary inputs, supplied by the EROS Data Center (EDC). The data will be in both 1-km and 100-m resolutions and will cover the surface of the Earth. Access software to this data will be provided by ECS as part of the Science Data Processing (SDP) toolkit. Upgrades to the data will be provided periodically by EDC, approximately once per year.

Sections 3.2 and 3.3 describe how the ancillary DEM data is received from EDC and ingested and archived by ECS.

Section 3.4 describes how the archived ancillary DEM data is accessed for data processing by science teams, and Section 3.5 describes the policy for access by external users.

Section 3.6 provides the detailed format of the DEM data, the input and outputs used in its creation, and the conversion software.

Section 3.7 gives sample PCF file entries for accessing the DEM data for data processing.

Interfaces (shown in Figure 3.1-1):

- Raw DEM data is produced by EDC, for NASA. This data is the binary formatted representation; the content specified by the SWAMP committee of the IWG.
- ECS reformats the 1-km binary data to HDF-EOS grid format, the standard data format of ECS.
- ECS ingests and archives the HDF-EOS grid format data at the EDC archive center. It is expected that occasional updates will be made to the data throughout the lifetime of the EOS program.
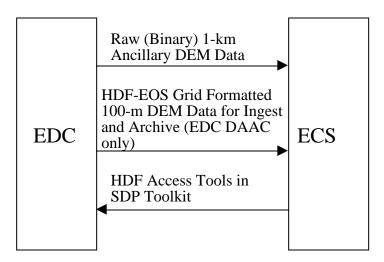- Software to access this data is provided by ECS in the SDP toolkit.

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Figure 3.1-1. Ancillary DEM Interface Data Flows

3.2 Data Ingest into ECS

The converted data can be inserted into the ECS Data Server by a variety of methods. The recommended method is the static file insertion facility provided by ECS. A program called the Insert Static File, in the SSIT Manager utility, is used for inserting a static data granule into the Data Server. A summary of the process is given in the Operations Concept for Digital Elevation Model Data in ECS, document number 162-WP-003-001. Details are found in DID 625, ECS SSI&T Training Manual, and DID 611 – Mission Operations Procedures.

It is expected that Digital Elevation Model data will be updated infrequently following initial insertion. ECS provides two methods of identifying these updates.

1. The collection will have an Earth Sciences Data Type (ESDT) which specifies the collection. 2. These ESDTs can be versioned upon subsequent updates. Older versions can be copied over, but some should be kept for possible use in the future.

3.3 Data Archival

The 100-m DEM data in HDF format will be permanently archived at EDC. The 1-km DEM data will be available at all ECS DAACs. The data will be accessible to science data processing software via the ECS Planning and Data Production System (PDPS). Low resolution data will be available on disk, accessible directly by the PDPS. High resolution data will be accessible through the ECS Science Data Server (SDSRV). The high resolution and low resolution data will be stored on D3 tape in the ECS archives.

The DEM is described in the ECS inventory by Earth Sciences Data Types (ESDTs). Each resolution is described as a collection by an ESDT. The ESDT contains a descriptor file which has attributes describing the entire data collection. The ESDT also contains an attribute specifying the version of the collection. This version ID will be modified when an update occurs. These procedures are described in detail in the Science Software I&T Operational Procedures for

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the ECS Project (162-TD-001-004) and in The Mission Operation Procedures for the ECS Project (611-CD-004-005)

3.4 DEM Access for Instrument Team Processing

3.4.1 Data access by the ECS Production System.

DEM data, to be used during science data processing, will be provided to the processing software by the ECS Data Production System. As described in Section 3.3, high resolution (100 m) data will be stored in the ECS archive and will be made available to the production system (PDPS) on request. The low resolution (1 km.) data will be available directly from RAID disk attached to the production system, but also stored in the ECS archive. Typically, a data processing request from the production system will query the ECS Science Data Server for a subset of DEM data specified by a bounding rectangle (corner points of latitude and longitude). If the data is available, one or more tiles, encompassing the requested area, will be returned to the production system. These files are staged to local disk, by PDPS. A Process Control File (PCF) is created that specifies the mapping between logical Ids (LIDs) for DEM data files and the staged physical file names. In this way, science data production code, can access the data through LIDs, and not need to know actual physical file location

Use of the PCF is further described in Section 3.4.2. Sample PCF file entries are provided in Section 3.7. The process of access to data by science data production software is specified in detail in the SDP Toolkit Users Guide for the ECS Project. It can be obtained from http://edhs1.gsfc.nasa.gov under Toolkits.

3.4.2 Data Access by a Science Data Processing Executable (PGE)

Science data processing software, running at the DAAC will access the DEM data, provided through the Production System, through a standard interface provided by ECS. This is known as the Science Data Processing Toolkit (SDP Toolkit). The Digital Elevation Model (DEM) access tools described in this section are described in the SDP Toolkit Users Guide for the ECS Project (333-CD-100-002).

The DEM Toolkit tools are intended for accessing a hierarchy of DEM data sets. In order to utilize these functions, an individual user must install the SDP Toolkit on their machine. Data production software running in the DAAC will have the toolkit available. This hierarchy of data sets will include data from multiple resolutions. The DEM tools access this information based on resolution; a user indicates from which resolutions they are interested in query data. Each of these resolutions consists of multiple files. For example, the 3 arc second resolution data set (~100 m postings) is divided into 648 100X100 files, 239 of which contain DEM data. The number and extent of these files are transparent to the user. The user indicates interest in a particular resolution with a resolution tag. This resolution tag is initialized by the tool PGS_DEM_Open. The resolution tags MUST be initialized, either individually or as an array of the resolution tags, BEFORE any of the other DEM tools may access the data set at that resolution. These initialized resolution tags allow access of the underlying files (in the case of the 3 arc second resolution, the 100X100 files), without having to actually specify the particular physical file.

As mentioned above, the DEM tools may be used with a hierarchy of DEM data sets. Most of the DEM tools not only are able to accept a single resolution tag, but they may even accept a list, an array, of resolution tags. The first element of the array is the tag for the preferred resolution of the data (generally this will be the highest resolution data set). Each successive entry in the array will be in descending interest of use: in general, lower spatial resolution. If one inputs an array of resolution tags to a DEM tool, then one may be able to gain information across resolutions. For example, one may enter an array of resolution tags into the tool PGS_DEM_GetRegion. This tool will go to the data set files of the first resolution tag and extract the region of interest. If any of the points in the region of interest is a fill value, then the tool will access the next data set in the input array (for that particular point). It will continue to step through progressively lower resolution data sets (depending on the order of the elements in the inputted array) until it finds "valid", actual, non-fill value, data.

The data sets supported by SDP Toolkit are the 3 arc second (~100 m postings) and 30 arc second (approximately 1-km postings) resolution data sets. The layers that will be available in both resolutions are:

- elevation (PGSd_DEM_ELEV),
- water/land (PGSd_DEM_WATER_LAND),
- slope (PGSd_DEM_SLOPE),
- aspect (PGSd_DEM_ASPECT),
- stD. dev. Elevation (PGSd_DEM_STDEV_ELEV),
- stD. dev. Slope (PGSd_DEM_STDEV_SLOPE), and
- geoid (PGSd_DEM_GEOID).

Also other data included in the data files associated with 30 arc second files are:

- data source (PGSd_DEM_SOURCE),
- quality metric (PGSd_DEM_HORIZONTAL_ACCURACY and PGSd_DEM_VERTICAL_ACCURACY).

Both data sets are in HDF-EOS GRID format. The 3 arc second resolution data set is divided into 648 100X100 files, with 239 of the files containing DEM data. The 30 arc second resolution data set divides the earth's surface into 6 files. Both resolutions are in a Geographic Projection. By geographic, we mean that degrees of latitude and longitude are linearly mapped to row and column pixels, respectively.

Due to size, the data is split into two physical files for each resolution, two for the 30 arc second data and two for the 3 arc second data. One file contains standard deviation (STDEV) data, and the other file contains the other parameters. File contents are listed in Tables 3.6.2-1 and 3.6.2-2. In the ECS, the files are identified to the system by the following ESDT short names:

DEM_100M - 3 arc second data

DEM_1KM   - 30 arc second data

DEM100MS - 3 arc second standard deviation data

DEM_1KMS - 30 arc second standard deviation data

To access these data sets, they must be included in the PCF, which specifies all input and output files to be accessed by the toolkit, during a production run. Details of creation and usage of this file can be found in the Toolkit Users Guide. The files which make up the 30 arc second resolution should each have a logical ID equal to 10650. The standard deviation data file for the 30 arc second data has a logical ID equal to 10651. The logical ID of the 3 arc second resolution files should be 10653. The standard deviation data file for the 3 arc second data has a logical ID equal to 10651. For more information on setting up a PCF for DEM access, see both the DEM data set README file and the PCF template which accompanies the Toolkit. See Section 3.7 for sample PCF file entries.

3.5 DEM Access by External Users

DEM data stored at EDC will be used by science processing software at other ECS DAACs. Multiple methods exist to provide the data to the other DAACs. The EDC DAAC may request that the data either be ftp "pushed" to the other DAACs or to make it available for ftp "pull" by the other DAACs. The data may be copied to media for distribution to the other DAACs. After AM-1 launch, the data may be transferred automatically between DAACs using the ECS cross mode ingest process. The DEM data will not be generally available to individual external users.

3.6 Data Flows

The following subsections provide detailed descriptions of each data flow between the ECS and EDC for DEM data, and associated software.

3.6.1 Input Data

This section describes the DEM data provided by EDC. The data are provided in 1-km (30 arc sec) and 100-m (3 arc sec) resolution. The former are provided in six 90^0 X 120^0 files, covering the surface of the earth[1]. The latter are provided in 648 (239 containing DEM data), 10^0 x 10^0 files, also covering the earth's surface. The lower resolution files include both elevation data and a land/sea mask. The high resolution files contain elevation data plus several other parameters, listed below. ASCII header files, accompanying each binary file, include information on format, units, projection, number of rows and columns, layout, fill value, datum, spheroid, and statistics. These files were used in constructing the following table (Table 3.6.1-1).

The metadata are attributes describing the file content and are contained in an ASCII file and listed in detail in Appendices B and C.

Table 3.6.1-1. Input Data Description

Data Set Name	Format	Units	1-km Resolution 90^0X120^0 Size[1]	100-m Resolution 10^0X10^0Size[3]
Elevation	2 byte int.	meter	311 MB	288 MB
Land/sea Mask	1 byte int.	codes	155 MB	144 MB
Slope[2]	1 byteint.	degrees	155 MB	18 - 288 MB
Aspect	2 byte int.	degrees	311 MB	288 MB
Std. Dev. Elevation	2 byte int.	meter	311 MB	288 MB
Std. Dev. Slope[2]	1 byte int.	degrees	155 MB	18 - 288 MB
Source	1 byte int.	code	(1^0X1^0 Resolution	0.07 MB)
Horiz. Accuracy	2 byte int.	meter	(1^0X1^0 Resolution	0.13 MB)
Vert. Accuracy	2 byte int.	meter	(1^0X1^0 Resolution	0.13 MB)
Method	1 byte int.	code	(1^0X1^0 Resolution	0.07 MB)
Geoid	2 byte int.	meter	(1^0X1^0 Resolution	0.13 MB)
Metadata	ASCII file		Refer to Appendix B	Refer to Appendix C

Additional parameters are expected and placeholders have been left in output data files described in Section 3.6.2, Table 3.6.2-1.

Note 1.   The input data sets for 1-km resolution will be in six 90^0 X 120^0 tiles

Note 2.   For 1-km Resolution, both Slope and Std. Dev. Slope are 1 byte integers. For 100-m Resolution the data for Slope and Std. Dev. Slope have different lengths for different tiles. The minimum length is 1 bit and the maximum length is 16 bits.

Note 3.   Pixel locations within each tile will be defined at the center points of the pixels for both resolution data sets. That is, the latitude and longitude of each pixel will be defined at the center points of each pixel.

3.6.2 Output Data

This section describes the format of data to be used by ECS. Output data is accessed by the SDP Toolkit, which is described in Section 3.6.3. There will be 6 X 3 files for the 1-km data set (each covering 90^0X120^0 region) and 648 X 2 files (239 X 2 containing DEM data) for 100-m data set (each covering 10^0X10^0 region). The format is HDF. The filenames and volumes are listed in Tables 3.6.2-1 and 3.6.2-2. Note that the 1-km data is uncompressed, while the 100-m data is compressed using HDF internal compression.

Table 3.6.2-1. Contents of Output HDF File

Data Set Name	Size	Content
dem30ARC_<upperleftcorner coordinates>.hdf	1.1 GB	Elevation, Land/sea Mask, Slope, Aspect, Source, Method, Horizontal Accuracy, Vertical Accuracy, Geoid, and Metadata
stddev30ARC_<upperleftcorner coordinates>.hdf	630 MB	Std. Dev. Elevation , Std. Dev. Slope, and Metadata
obscshad30ARC_<upperleft corner coordinates>.hdf	2.2 GB	Topo Obscur., Topo shadow, and Metadata
dem3ARC_<upperleftcorner coordinates>.hdf	270 MB	Elevation, Land/sea Mask, Slope, Aspect, Geoid, and Metadata
stddev3ARC_<upperleftcorner coordinates>.hdf	74 MB	Std. Dev. Elevation , Std. Dev. Slope, and Metadata

Table 3.6.2-2 Contents of Output HDF File - Standard Deviation

Data Set Name	Size	Content
stddev30ARC_<upperleftcorner coordinates>.hdf	630 MB	Std. Dev. Elevation , Std. Dev. Slope, and Metadata

3.6.3 Conversion Software

ECS supplies software for the conversion of the input binary data into output HDF data. The output data have associated ECS compatible metadata. There are four conversion drivers; two for the 100-m data set and two for the 1-km data set.

3.6.3.1 Drivers for 1-km Data Set

The first conversion driver converts input binary data for Elevation, Land/sea mask, Slope, and Aspect to HDF format and writes them to a single file. Each input file covers a 90^0X120^0 region, and six files cover the surface of the earth. The conversion is done one at a time for each of the six regions. In addition, metadata, geoid, and source accuracy data are written on each HDF file. The metadata file for both 1 km and 100 m resolutions include inventory metadata and archive metadata (see Appendices B and C).

The second conversion driver converts input binary data for Standard Deviation Elevation and Standard Deviation Slope to HDF format and writes them to a single file. Each input file covers a 90^0X120^0 region, and six cover the surface of the earth. The conversion is done one at a time for each of the six regions. In addition, metadata is written on each HDF file.

3.6.3.2 Drivers for 100-m Data Set

The first conversion driver converts input binary data for Elevation, Land/sea mask, Slope, and Aspect to HDF format and writes them to a single file. Each input file covers a 10^0X10^0 region,

and 648 HDF files cover the whole world. The conversion is done one at a time for each of the 648 regions. In addition, metadata and geoid data are written on each HDF file.

The second conversion driver converts input binary data for Standard Deviation Elevation and Standard Deviation Slope to HDF format, and writes them to a single file. If each input file covers a $10^0 X 10^0$ region, and 648 HDF files cover the whole world. The conversion is done one at a time for each of the 648 regions. In addition, metadata are written on each HDF file .

All conversion driver software is written in C language and can be run on SUN and SGI machines.

Note that only 239 of the 648 regions actually contain DEM data due to lack of coverage.

3.7 Example PCF File Entries for Data Processing

Figures 3.7-1 and 3.7-2 show example staged files and DEM data file entries in the PCF file, respectively, for the region of interest where the upper left corner is (W95, N45) and the lower right corner is (W85, N35).

<div align="center">

dem3ARC_W100N50.hdf
dem3ARC_W90N50.hdf
dem3ARC_W100N40.hdf
dem3ARC_W90N40.hdf
stddev3ARC_W100N50.hdf
stddev3ARC_W90N50.hdf
stddev3ARC_W100N40.hdf
stddev3ARC_W90N40.hdf
dem30ARC_W180N90.hdf
stddev30ARC_W180N90.hdf

</div>

Figure 3.7-1. Sample Staged Files

<div align="center">

10650|dem30ARC_W180N90.hdf|<full path>|||dem30ARC__W180N90.hdf|1
10651|stddev30ARC_W180N90.hdf|<full path>|||stddev30ARC__W180N90.hdf|1
10653|dem3ARC_W100N50.hdf|<full path>|||dem3ARC_W100N50.hdf|4
10653|dem3ARC_W100N40.hdf|<full path>|||dem3ARC_W100N40.hdf|3
10653|dem3ARC_W90N50.hdf|<full path>|||dem3ARC_W90N50.hdf|2
10653|dem3ARC_W90N40.hdf|<full path>|||dem3ARC_W90N40.hdf|1
10654|stddev3ARC_ W100N50.hdf|<full path>|||stddev3ARC_ W100N50.hdf|4
10654|stddev3ARC_ W100N40.hdf|<full path>|||stddev3ARC_ W100N40.hdf|3
10654|stddev3ARC_ W90N50.hdf|<full path>|||stddev3ARC_ W90N50.hdf|2
10654|stddev3ARC_ W90N40.hdf|<full path>|||stddev3ARC_ W90N40.hdf|1

</div>

Figure 3.7-2. Sample DEM Data Files in PCF

4. Billing and Accounting via DORRAN

The ECS will interface with the DORRAN system for ordering all ECS held Landsat products archived at the EDC.

4.1 Interface Overview

ECS does not currently provide a billing and accounting capability which is needed by the EROS Data Center (EDC) to recover costs of Landsat-7 processing. This interface will enable DORRAN to validate orders prior to processing and perform the billing function after an order has been filled. This section defines the interface between ECS and EDC that is required to implement the DORRAN interface. Please refer to Appendix A for requirements and Appendix D for the pricing algorithm.

Section 4.2 - Defines a high-level operations concept of how the order comes from the user through the various ECS components and into EDC as well as how information flows from EDC back to ECS.

Section 4.3 - Describes the primary data flows between ECS and EDC. This is a textual description of the purpose of each flow.

Section 4.4 - Defines the detailed formats of messages. This is a definition of all the flows and the exact contents of them.

4.2 Operations Concept

4.2.1 L0R Concept

The user will order Landsat-7 Level 0R scene products through the EOS Data Gateway (EDG). The EDG will route Landsat-7 searches to the V0-ECS Gateway. The V0-ECS Gateway will submit the search to the Science Data Server (SDSRV), and return the results back to the client. If the user decides to order data, the order will transfer to the EDC DORRAN system through the EDC V0 IMS Server. EDC User Services will validate the order using normal procedures currently employed at EDC. When the order is validated and billing arrangements are made with the user, the order transfers back to ECS with an indication that the order should be either processed or cancelled. EDC User Services ensures that funds are in the user's account before directing ECS to process the order The ECS Data Server will process the order. After completion of order processing, the ECS Data Distribution (DDIST) system will send e-mail notification to the user and to the EDC DORRAN system. If processing was successful, the notice will include an Order ID and Request ID as well as all the granules included in the order. EDC will finalize, package, and ship the product to the user. EDC will then relate the order to the one that was validated, using the ECS Order ID:Request ID, and bill the user. If processing was unsuccessful, the notice will include an Order ID and Request ID, as well as a failure indication and reason. The unique Order ID:Request ID assigned by ECS is used by both systems

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to track the order. This is the mechanism by which the order will be tracked between the two systems.

4.2.2 Floating Scene (Partial Sub-Interval) Concept

The floating scene products will differ slightly in concept prior to product requests. Client modifications will allow the user to select an area of the sub-interval product. The user will then request a pricing estimate for the area and options selected. The ECS system will estimate the size of the product in scan lines by interpolating the latitude/longitude corner points. Once the size is determined, the ECS pricing module will perform a table look-up to determine the price. Other options, such as band selection, may also affect the pricing module. Once the order is made, the flow through ECS and DORRAN is the same as described in 4.2.1. Refer to Appendix D for the pricing algorithm.

4.2.3 Level 1 Concept

The Level 1 systems follow a different data flow for orders. However, when acquiring the L0R product used for input, the flow is the same as described in 4.2.1. This interface is documented in the *Interface Control Document Between the Level 1 Product Distribution System (LPDS) and the EOSDIS Core System (ECS).*

4.3 Data Flow Descriptions

4.3.1 Data Flows

Figure 4.3.1-1 shows the data flows that occur between ECS and the EDC DORRAN system. These data flows are primarily using the Version 0 Object Definition Language (ODL) protocol. The description of the flows is provided in Table 4.3.1-1.
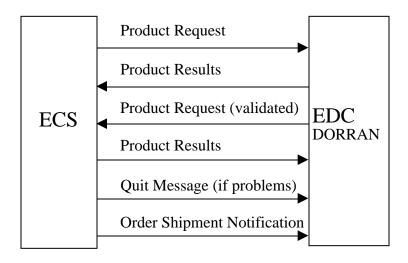

Figure 4.3.1-1. ECS-EDC DORRAN Data Flows

Table 4.3.1-1. Data Flow Descriptions

Data Flow	Direction	Description
Product Request	ECS - EDC DORRAN	This flow defines that a user has submitted a new request for Landsat-7 data. Only Landsat-7 data orders will be flowed in this direction. All other ECS orders will be sent to the SDSRV.
Product Result	EDC DORRAN - ECS ECS - EDC DORRAN	This flow is an acknowledgement returned in response to a product request and includes error codes..
Product Request (validated)	EDC DORRAN - ECS	This flow returns the order ODL back to ECS. The only modifications allowed to the order are deletion of units or cancellation of the entire order by sending a CANCEL in the PACKAGE ID field. ECS will associate the order with the original assigned ORDER_ID:REQUEST_ID and resume processing the order.
Quit Message	ECS - EDC DORRAN	This flow is the notification of premature termination of a session due to problems.
Order Shipment Notification	ECS - EDC DORRAN	This flow defines what was shipped to the user. The Order ID:Request ID is included so that it can be used to relate back to what the original request was and who it was made by.

4.4 Message Definitions

4.4.1 Product Request (ECS to EDC)

The Product Request message originates with the EOS Data Gateway. It is used by ECS and DORRAN for placement of the order into each system.

The definitions of the keywords are provided in Appendix A of Interface Control Document Between the EOSDIS Core System (ECS) and the Version 0 System for Interoperability (505-41-30).

The REQUEST_ID keyword in the Product Request message contains the ECS Order ID:Request ID that will be used to match to the Order ID and Request ID received from ECS after shipment of the product. EDC will correlate the Order ID:Request ID in the Product Request to the individual Order ID and Request ID fields in the Order Shipment Notice. The format of the REQUEST_ID in the Product Request is "Order ID:Request ID", where Order ID is associated with the entire order and the Request ID a subportion of the order (e.g., "15:34", where "15" is the Order ID and "34" is the Request ID).

The Order ID:Request ID provided by ECS will be a variable length alphanumeric character string whose maximum length is twenty characters. ECS will guarantee that this identifier is unique.

The DATASET_ID sent from ECS to DORRAN is "Landsat-7 Level-0R WRS Scene" for fixed scene orders or "Landsat-7 Level-0R" for Landsat-7 floating scene orders.

Section 4.4.1.1 shows the ODL Normalization form of a Product Request.

Section 4.4.1.2 contains a sample Product Request message for L0R WRS Scene Products. The BANDs to be included are in the example, and are defined in the ECS ESDT definition (descriptor) files.

Section 4.4.1.3 contains a sample Product Request for L0R Floating Scene Products.

The full set of band names are:

"QA_BAND1_PRESENT"

"QA_BAND2_PRESENT"

"QA_BAND3_PRESENT"

"QA_BAND4_PRESENT"

"QA_BAND5_PRESENT"

"QA_BAND6_PRESENT_F1"

"QA_BAND6_PRESENT_F2"

"QA_BAND7_PRESENT"

"QA_BAND8_PRESENT"

4.4.1.1 ODL Normalization Form for Product Request

```
PRODUCT_REQUEST group ::==
MESSAGE_ID
REQUEST_ID
DATA_CENTER_ID
[AUTHENTICATOR]
[ECS_AUTHENTICATOR]
[INITIAL_USER_KEY]
USER_AFFILIATION group
CONTACT_ADDRESS group
SHIPPING_ADDRESS group
BILLING_ADDRESS group
(LINE_ITEM group)+        repeated group
MONITOR group
VERSION group

USER_AFFILIATION group ::==
     CATEGORY
     TYPE

CONTACT_ADDRESS group ::==
     [TITLE]
     LAST_NAME
     FIRST_NAME
     [MIDDLE_INITIAL]
```

[ORGANIZATION]
                    ADDRESS
                    CITY
                    STATE
                    [ZIP]
                    COUNTRY
                    PHONE
                    [FAX]
                    EMAIL

        SHIPPING_ADDRESS group ::==
                    [TITLE]
                    LAST_NAME
                    FIRST_NAME
                    [MIDDLE_INITIAL]
                    [ORGANIZATION]
                    ADDRESS
                    CITY
                    STATE
                    [ZIP]
                    COUNTRY
                    PHONE
                    [FAX]
                    EMAIL

        BILLING_ADDRESS group ::==
                    [TITLE]
                    LAST_NAME
                    FIRST_NAME
                    [MIDDLE_INITIAL]
                    [ORGANIZATION]
                    ADDRESS
                    CITY
                    STATE
                    [ZIP]
                    COUNTRY
                    PHONE
                    [FAX]
                    EMAIL

        LINE_ITEM group ::==
                    DATASET_ID
                    [PACKAGE_ID]
                    PROCESSING_OPTIONS
                    MEDIA_TYPE
                    MEDIA_FORMAT
                    [SUBSET_SPEC group]
                    [ADDITIONAL_INFO]
                    BILLING_ID
                    EST_COST

        MONITOR group ::==
                    TX_CLIENT

```
                    [RX_SERVER]
                    [TX_SERVER]
                    [RX_CLIENT]
                    [SESSION_ID]

          VERSION group ::==
                    PROTOCOL_VERSION
                    SENDER_VERSION
                    [IMS_STAFF]


          SUBSET_SPEC group
          (SPECIALIZED_CRITERIA  group)*


          SPECIALIZED_CRITERIA group ::==
                    [CRITERIA_MAX]
                    [CRITERIA_MIN]
                    CRITERIA_NAME
                    [CRITERIA_TYPE]
                    [CRITERIA_VALUE]
          [POINT_LOC group | POLYGON_LOC group |
          RANGE_LOC group]


          POINT_LOC group ::==
                    LATITUDE
                    LONGITUDE
          POLYGON_LOC group ::==
                    LATITUDE
                    LONGITUDE
                    [MAP_PROJECTION_TYPE]
                    [POLE_INCLUDED]
                    [TANGENT_LATITUDE]
                    [TANGENT_LONGITUDE]

          RANGE_LOC group ::==
                    EAST_LONGITUDE
                    NORTH_LATITUDE
                    SOUTH_LATITUDE
                    WEST_LONGITUDE
```

Note: BILLING_ID is used for the Level 1 interface. It is always passed to DORRAN when it is included in the ODL. (Refer to the LPDS ICD for Level 1 products.)

4.4.1.2 ODL Sample Product Request for L0R WRS Scene Product

```
GROUP             = PRODUCT_REQUEST
MESSAGE_ID        = "M931954515"
REQUEST_ID        = "9055:12914"
DATA_CENTER_ID    = "EDC"
GROUP             = USER_AFFILIATION
  CATEGORY        = ""
  TYPE            = ""
END_GROUP         = USER_AFFILIATION
GROUP             = CONTACT_ADDRESS
  LAST_NAME       = "Kirk"
  FIRST_NAME      = "J"
  ADDRESS         = "Trek"
  CITY            = "Sioux Falls"
  STATE           = "SD"
  ZIP             = ""
  COUNTRY         = "USA"
  PHONE           = "1234"
  FAX             = ""
  EMAIL           = "kirk@startrek"
END_GROUP         = CONTACT_ADDRESS
GROUP             = SHIPPING_ADDRESS
  LAST_NAME       = "Kirk"
  FIRST_NAME      = "J"
  ADDRESS         = "Trek"
  CITY            = "Sioux Falls"
  STATE           = "SD"
  ZIP             = ""
  COUNTRY         = "USA"
  PHONE           = "1234"
  FAX             = ""
  EMAIL           = "kirk@startrek"
END_GROUP         = SHIPPING_ADDRESS
GROUP             = BILLING_ADDRESS
  LAST_NAME       = "Kirk"
  FIRST_NAME      = "J"
  ADDRESS         = "Trek"
  CITY            = "Sioux Falls"
  STATE           = "SD"
  ZIP             = ""
  COUNTRY         = "USA"
  PHONE           = "1234"
  FAX             = ""
  EMAIL           = "kirk@startrek"
END_GROUP         = BILLING_ADDRESS
GROUP             = LINE_ITEM
  DATASET_ID      = "Landsat-7 Level-0R WRS-Scene"
  PACKAGE_ID      = "SC:L70RWRS.002:2000096806"
  PROCESSING_OPTIONS = "Native Granule"
  MEDIA_TYPE      = "FtpPull"
  MEDIA_FORMAT    = "FILEFORMAT"
  EST_COST   = 475
```

```
              END_GROUP          = LINE_ITEM

              GROUP            = MONITOR
                SESSION_ID       =
              "e0ins02.edcb.ecs.nasa.gov:4243:19990714:0&
                  71515"
                RX_CLIENT        = (
                  "931954515",
                  "921382")
                TX_CLIENT        = (
                  "931954515",
                  "930517")
                RX_SERVER        = (
                  "931954516",
                  "140620")
              END_GROUP          = MONITOR
              GROUP            = VERSION
                CLIENT_VERSION     = "CHUI_REV4"
                PROTOCOL_VERSION   = 3.2
                IMS_STAFF        = "staff"
                SENDER_VERSION     = "CHUI_REV4"
                RESPONSE_COMPRESSION = 1
              END_GROUP          = VERSION
            END_GROUP          = PRODUCT_REQUEST
            END
```

4.4.1.3 ODL Sample Product Request for L0R Floating Scene Product

```
            GROUP = PRODUCT_REQUEST
            MESSAGE_ID       = "B924549396"
            REQUEST_ID       = "924548327-24140-P1:1234"
            DATA_CENTER_ID     = "ECS-TEST"
            GROUP = USER_AFFILIATION
              CATEGORY  = "USA"
              TYPE = "Government"
            END_GROUP = USER_AFFILIATION
            GROUP = CONTACT_ADDRESS
              TITLE = ""
              FIRST_NAME  = "James"
              MIDDLE_INITIAL     = "T"
              LAST_NAME        = "Kirk"
              ORGANIZATION       = ""
              ADDRESS         = ("123 A St.")
              CITY           = "Washington"
              STATE          = "DC"
              ZIP          = ""
              COUNTRY          = "USA"
              PHONE          = "202-444-5555"
              FAX          = ""
              EMAIL          = jkirk@starfleet.com
            END_GROUP          = CONTACT_ADDRESS
            GROUP            = SHIPPING_ADDRESS
              TITLE          = ""
```

```
                   FIRST_NAME        = "James"
                   MIDDLE_INITIAL    = "T"
                   LAST_NAME         = "Kirk"
                   ORGANIZATION      = ""
                   ADDRESS           = ("123 A St.")
                   CITY              = "Washington"
                   STATE             = "DC"
                   ZIP               = ""
                   COUNTRY           = "USA"
                   PHONE             = "202-444-5555"
                   FAX               = ""
                   EMAIL             = "jkirk@starfleet.com"
                  END_GROUP          = SHIPPING_ADDRESS
                 GROUP               = BILLING_ADDRESS
                   TITLE             = ""
                   FIRST_NAME        = "James"
                   MIDDLE_INITIAL    = "T"
                   LAST_NAME         = "Kirk"
                   ORGANIZATION      = ""
                   ADDRESS           = ("123 A St.")
                   CITY              = "Washington"
                   STATE             = "DC"
                   ZIP               = ""
                   COUNTRY           = "USA"
                   PHONE             = "202-444-5555"
                   FAX               = ""
                   EMAIL             = "jkirk@starfleet.com"
                  END_GROUP          = BILLING_ADDRESS
                 GROUP               = LINE_ITEM
                   DATASET_ID        = "LANDSAT-7 LEVEL-0R V001"
                   PACKAGE_ID        = "SC:L70RWRS.001:2000022933"
                   PROCESSING_OPTIONS = "Native Granule"
                   MEDIA_TYPE        = "FtpPull"
                   MEDIA_FORMAT      = "FILEFORMAT"
                   BILLING_ID = "ORD=xxxxxxxxxxxxx, UNIT=0004"
                   EST_COST          = 350
                   GROUP = SUBSET_SPEC
                     GROUP = SPECIALIZED_CRITERIA
                       CRITERIA_NAME = "Spatial Subsetting"
                       CRITERIA_TYPE = "GEO"
                       GROUP             = POLYGON_LOC
                         LATITUDE          = (23.1663, 22.9001, 22.1692,
22.4337)
                         LONGITUDE         = (35.884, 37.7186, 37.5402,
35.7152)
                       END_GROUP         = POLYGON_LOC
                     END_GROUP = SPECIALIZED_CRITERIA
                     GROUP = SPECIALIZED_CRITERIA
                       CRITERIA_NAME = "Band Subsetting"
                       CRITERIA_TYPE = "String"
                       CRITERIA_VALUE =
```

```
                       "QA_BAND1_PRESENT","QA_BAND2_PRESENT","QA_
                       BAND6_PRESENT_F2")
                         END_GROUP = SPECIALIZED_CRITERIA
                         GROUP = SPECIALIZED_CRITERIA
                           CRITERIA_NAME = "Scan Line Size"
                           CRITERIA_TYPE = "Integer"
                           CRITERIA_VALUE = 452
                         END_GROUP = SPECIALIZED_CRITERIA
                       END_GROUP = SUBSET_SPEC
                     END_GROUP         = LINE_ITEM
                     GROUP             = MONITOR
                       SESSION_ID       =
                     "dms2.hitc.com:24792:19990419:151633"
                       TX_CLIENT        = ("924549399", "39593")
                       RX_SERVER        = ("924549399", "128955")
                     END_GROUP         = MONITOR
                     GROUP             = VERSION
                       SENDER_VERSION     = "imswww-2_2"
                       PROTOCOL_VERSION   = 3.2
                       IMS_STAFF         = "1"
                     END_GROUP         = VERSION
                     END_GROUP         = PRODUCT_REQUEST
                     END
```

4.4.2 Product Result (ECS to EDC and EDC to ECS)

The Product Result message is returned to acknowledge receipt of a Product Request. It includes contact information for the dataset. This message should be irrelevant for this interface aside from the STATUS_CODE and comment. The STATUS_CODE and STATUS_CODE_COMMENT fields should be checked to make sure the Product Request was successfully submitted. A good status return does not imply that the product has already been processed and shipped. It only means that it has been successfully received.

Section 4.4.2.1 shows the ODL normalization form for Product Result.

4.4.2.1 ODL Normalization Form for Product Result

```
            PRODUCT_RESULT group ::==
                    MESSAGE_ID
                    DATA_CENTER_ID
                    STATUS_CODE
                    [STATUS_CODE_COMMENT]
            (DAAC_CONTACT_ADDRESS group)+      (repeatable mostly to
                                                support "DAACs" that are
                                                consortia of multiple archives
                                                in the international community)

            MONITOR group

            [VERSION group]


            (MISC_URL group)*
```

```
        DAAC_CONTACT_ADDRESS group ::==
                CONTACT_NAME
                ORGANIZATION
                [ADDRESS]
                CITY
                [STATE]
                [ZIP]
                COUNTRY
                PHONE
                [FAX]
                [EMAIL]
                [DAAC_ORDER_ID]
                [DATASET_ID]


        MONITOR group ::==
                TX_CLIENT
                RX_SERVER
                TX_SERVER
                [RX_CLIENT]
                [SESSION_ID]



        VERSION group ::==Optional group
                PROTOCOL_VERSION
                SENDER_VERSION
                [IMS_STAFF]


        MISC_URL group::==
                URL
                URL_COMMENT
```

4.4.3 Product Request (EDC to ECS)

The Product Request message from the EDC system back to ECS must have the same format and contents as the Product Request message sent from ECS to EDC. The processing options should not change. The only permitted change is that some of the granules contained in the original Product Request message may be deleted as a result of the order validation process. Since the REQUEST_ID field will contain the same ECS Order ID:Request ID as ECS sent to EDC, ECS will be able to relate this request to the user's original order for request tracking purposes.

If through the course of the validation the user decides to cancel the entire order, EDC will send the Product Request message with one LINE_ITEM group with a PACKAGE_ID of CANCEL. This will signal to ECS that the order should be canceled. EDC should still attempt to check the STATUS_CODE that returns in the Product Result message to be sure that ECS accepted the cancellation.

4.4.4 Quit Message

If problems necessitate premature termination of the process, a quit message is transmitted from ECS to the EDC DORRAN as indicated in Figure 4.3.1-1. Specifically, the ECS V0-ECS Gateway sends a quit message (via the V0-ECS Gateway) back to EDC's DORRAN if the product request message from the EDC to the ECS cannot be processed due to server failures and other error conditions. Note that a response of this type usually indicates that operator intervention is necessary to fulfill the order request.

Section 4.4.4.1 contains the ODL Normalization Form of the Quit Message.

4.4.4.1 ODL Normalization form for Quit Message

```
QUIT group ::==
        [AUTHENTICATOR]
        [ECS_AUTHENTICATOR]
        MESSAGE_ID
        [DATA_CENTER_ID]
        STATUS_CODE
        [STATUS_CODE_COMMENT]
        MONITOR group
        VERSION group

MONITOR group ::==
        TX_CLIENT
        [RX_SERVER]
        [TX_SERVER]
        [RX_CLIENT]

        [SESSION_ID]

VERSION group ::==
        PROTOCOL_VERSION
        SENDER_VERSION
        [IMS_STAFF]
```

4.4.5 Order Shipment Notification

After ECS has processed the Product Request message, retrieved the data, and shipped it to the user, ECS will send an Order Shipment Notification via e-mail to configurable e-mail addresses. This e-mail notification can be parsed by EDC in order to determine which order it references. The ORDERID field will contain the same ECS Order ID and Request ID that was sent with the Product Request message from ECS to EDC (in the REQUEST_ID keyword). The failure notification information appended to the end of the message indicates whether all requested granules were distributed. If the whole request failed then the FAILURE line is included with a failure message, just before the MEDIATYPE. Figure 4.4.5-1 shows the body of an example e-mail message that is generated for a successful shipment and Figure 4.4.5-2 shows the body of an example e-mail message that is generated when the order fails. Table 4.4.5-1 provides the definition of each field in the Order Shipment Notice.

Each Order Shipment Notification message begins with an explanatory preamble, customized to the delivery media type, and whether a success or failure (see example below). The preamble ends in a delimiter consisting of the following special character sequence: a blank line, a line of exactly 10 "+" signs, and another blank line. The preamble shall not contain keywords followed by a colon or any "+" signs.

```
Thank you for using the Earth Observing System Distribution System.
For more information on your request contact the DAAC.

Please include the data below in any correspondence with the DAAC.

The data distributed for this request can be found on the FTPHOST below
in the directory specified by FTPDIR below.

Thank You!



++++++++++

ORDERID: NONE
REQUESTID: 1829341436363
USERSTRING:
FINISHED: 07/02/1999 09:34:44

MEDIATYPE: FtpPush
FTPHOST: dss2
FTPDIR: /usr/ecs/OPS/CUSTOM/logs
MEDIA 1 of 1
MEDIAID:

        GRANULE:
UR:10:DsShESDTUR:UR:15:DsShSciServerUR:13:[RBD:DSSDSRV]:20:SC:AST_L1BT.001:611 6
        ESDT: AST_L1BT.001

                FILENAME: tahoe-north-middle.hdf
                FILESIZE: 5410105

                FILENAME: tahoe-north-middle.hdf.met
                FILESIZE: 71839
```

Figure 4.4.5-1. Sample Order Shipment Notice for Successful FTP Request

NOTE: The granule URs (Universal References) that are received in the successful notice should match the granule IDs that are received by EDC as part of the Product Request message

except that the granule URs are larger than the granule IDs. The format of the granule IDs in the Product Request message will be <granule type>:<ESDT Short Name.Version>:<number>. In the example above, SC is the granule type, AST_L1BT.001 is the ESDT short name and version, and 6116 is the unique number within that ESDT (Earth Science Data Type). In the Order Shipment Notification, the entire UR is given and everything before the granule type can be ignored. For parsing purposes, the operator or EDC system could ignore everything before and including the third colon from the right of the string.

Thank you for using the Earth Observing System Distribution System. We
apologize for not being able to distribute the requested data. For more
information on your request contact the DAAC.

Thank You!

++++++++++

ORDERID: NONE
REQUESTID: 178123750631810
USERSTRING:
FINISHED: 06/28/1999 12:44:40

FAILURE
The request failed
MEDIATYPE: FtpPush
FTPHOST: dss2
FTPDIR: /devdata1/OPS/l7temp

None of the requested granules are considered distributed.
The requested granules were:

UR:10:DsShESDTUR:UR:15:DsShSciServerUR:13:[RBD:DSSDSRV]:19:SC:L70RWRS.001:6331

Figure 4.4.5-2.. Sample Order Shipment Notification for Failed FTP Request

Table 4.4.5-1. Order Shipment Notification Field Definitions (1 of 3)

Content Category	Description	Type	Format/Max Size (bytes)	Value or Content Category: Value
Preamble	Free text explanation customized to the delivery media type and whether a success or failure	Variable String	ASCII	Free text, which shall not contain plus signs and keywords followed by a colon.
[Blank line]				
Delimiter	10 "+" signs	Fixed String	ASCII	++++++++++
[Blank line]				
ORDERID	ECS internal unique identifier of a data order	Variable String	ASCII (19B total, 10B for the actual value)	ORDERID: <value> where <value> is 1-10 alphabetic characters
REQUESTID	ECS internal unique identifier of a request.	Variable String	ASCII (21B, 10B for the actual value	REQUESTID: <value> where <value> is 1-10 alphanumeric characters
USERSTRING	For Future Use.	Variable String	ASCII (max of 80 characters)	USERSTRING:
FINISHED	Time at which data was available either on tape or in staging area	Fixed String	ASCII (28B, 19B for date and time)	FINISHED: MM/DD/YYYY <blank>HH:MM:SS
Blank line				
FAILURE	Simple notification that the request stopped. If failures are encountered, this line precedes a failure message. 'FAILURE' and message omitted otherwise.	Fixed String	ASCII (8B)	FAILURE
<failure message>	Message describing failure (if there is one).	Variable String	ASCII (25B)	<failure message> - either "The request was cancelled" or "The request failed".
MEDIATYPE	This type indicates the type of media that was distributed to the user.	Variable String	ASCII (18 B, including 7B for the media type value)	MEDIATYPE: <value> where <value> is 8MM, FTPPULL, or FTPPUSH
FTPHOST	Name or IP Address of ECS workstation where data were made available (if applicable).	Variable String	ASCII (73B, 64B for the host name or IP Address)	FTPHOST: <value> where value is a hostname or IP Address.
FTPDIR	File directory location where ftp can be picked up (if applicable)	Variable String	ASCII	FTPDIR: <directory>

Table 4.4.5-1. Order Shipment Notification Field Definitions (2 of 3)

Content Category	Description	Type	Format/Max Size (bytes)	Value or Content Category: Value
FTPEXPR	Time after which ECS is free to remove the requested data from the pull area (if applicable)	Fixed String	ASCII (27B, 19B for date and time)	FTPEXPR: MM/DD/YYYY <blank>HH:MM:SS
MEDIAFMT	Media format of hard media products (if applicable)			MEDIAFMT: <value> Where <value> is a format type such as TAR
MEDIA	Media number within request (if applicable)	Variable String	ASCII	MEDIA <x> of <y> where x is which notification this is and y is the total number of notifications expected.
MEDIAID	Volume ID (Bar code) (if applicable)	Fixed String	ASCII (8B)	MEDIAID: <value>
Blank line				
GRANULE	Indicates start of a data granule. Value is the UR for that data granule. (Repeat for each granule; indent one tab.)	Variable String	ASCII (98B including 89 B for the UR)	GRANULE: <UR>
ESDT	Specifies the short name and version (001 through 255) of the Earth Science Data Type (Repeat for each granule, Indent by 1 tab)	Variable String	ASCII (17B, 11B max for the ESDT)	ESDT: L70RWRS.001 Or ESDT: L70R.001
Blank line				
FILENAME	The filename for a file in the present granule. Names of non-metadata files are set to the LocalGranuleID metadata parameter (plus sequence number if more than one file in a granule), if available. Otherwise, they are set to the file name as inserted into the ECS archive. (Repeat for each file in present granule.) Names of metadata files end in ".met". (Indent by 2 tabs.) (Repeat for each file present; indent by 2 tabs)	Variable String	ASCII	FILENAME: <filename>
FILESIZE	The file's size in Bytes (Repeat for each file in present granule; indent 2 tabs)	Variable String	ASCII	FILESIZE: <size>

Table 4.4.5-1. Order Shipment Notification Field Definitions (3 of 3)

Content Category	Description	Type	Format/Max Size (bytes)	Value or Content Category: Value
Blank line				
Failure Notification	Message appended to the end of shipment notices when there are failures, listing the granules requested. In the failure case, none of the granules are considered by the system to be distributed. There are no partial failures.	Variable String	ASCII	"None of the requested granules are considered distributed. The requested granules were: <Granule UR list>"

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Appendix A. EDC Interface Requirements

Req. #	source interface	destination interface	text
EDC-0010	EDC	ECS	ECS shall receive the raw ancillary DEM data and Land/sea mask data for 1-km resolution, in binary format.
EDC-0020	ECS	ECS	ECS shall reformat the binary formatted 1-km ancillary DEM data and Land/sea mask data to HDF-EOS grid format. EDC shall reformat the binary formatted 100-m ancillary DEM and Land/sea mask data to HDF-EOS grid format.
EDC-0030	EDC	ECS	EDC shall provide occasional updates of the raw ancillary DEM and Land/sea mask data, in binary format, throughout the lifetime of the EOS program.
EDC-0040	ECS	EDC	ECS shall ingest and archive the HDF-formatted ancillary DEM data, and will replace the archived data with updates upon receipt.
EDC-0050	ECS	EDC	ECS shall provide to EDC software for the conversion of input binary ancillary 100-m DEM data into output HDF format data.
EDC-0060	ECS	EDC	ECS shall provide software to access the HDF-format ancillary DEM data (via the SDP toolkit).
EDC-0070	ECS	EDC	ECS shall be capable of interfacing with the EDC Distributed Ordering Research, Reporting and accounting Network (DORRAN), for user orders of Landsat L0R data products (1 to 9 bands); and Landsat L0R floating subinterval data products (variable from 0.5 WRS scene to full subinterval; 1 to 9 bands)
EDC-0080			ECS shall route all user orders for Landsat-7 Level 0R fixed scene products to EDC for account and order verification prior to processing the order.
EDC-0090			ECS shall partition user orders, if necessary, so that only the Landsat-7 portion of ECS orders are routed to EDC.
EDC-0100			EDC shall provide the following services for all ECS Landsat-7 Level 0R fixed scene product orders: a) Account and order verification prior to order processing; b) Billing after successful order processing; and c) Funds collection.
EDC-0110			ECS shall have the capability to send and EDC shall have the capability to receive Product Request messages, via V0 protocols, for Landsat-7 Level 0R fixed scene granules.
EDC-0120			The Product Request message shall include, at a minimum: a) Unique Order Identifier; b) ECS user contact information; c) ECS user billing information; d) ECS user shipping information; and e) One or more Landsat-7 Level 0R fixed scene granule

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			identifiers.
EDC-0130			EDC shall have the capability to send and ECS shall have the capability to receive Product Results messages, via V0 protocols, that indicate whether or not a corresponding Product Request message has been accepted by EDC or contained an error.
EDC-0140			EDC shall match ECS user information provided in a Product Request message with information in the DORRAN accounting system and then validate the account and order contents with the user.
EDC-0150			EDC shall modify the Product Request message, if requested by the user, to delete one or more Landsat-7 Level 0R fixed scene granule identifiers from the order.
EDC-0160			EDC shall modify the Product Request message, if requested by the user, to change the shipping address.
EDC-0170			EDC shall have the capability to re-send and ECS shall have the capability to receive validated Product Request messages, via V0 protocols, for Landsat-7 Level 0R fixed scene granules.
EDC-0180			A validated Product Request message shall provide an indication of whether or not the entire order is to be processed by ECS or cancelled.
EDC-0190			EDC shall ensure that funds are in the customer's account before re-sending a Product Request message to ECS indicating that the order is to be processed.
EDC-0200			A validated EDC Product Request message shall contain the same Order Identifier as its corresponding ECS Product Request message.
EDC-0210			ECS shall have the capability to send and EDC shall have the capability to receive protocols that indicate whether or not a corresponding validated Product Request message has been accepted by ECS or contained an error.
EDC-0220			ECS shall have the capability to send and EDC shall have the capability to receive Order Completion Notification messages, via email protocol, that indicate completion of order processing for a Product Request.
EDC-0230			The Order Completion Notification shall include, at a minimum: a) Unique Order Identifier b) Completion Date and Time; c) If successful, the list of Landsat-7 Level 0R fixed scene granules to be shipped; and d) If unsuccessful, a failure indication and reason.
EDC-0240			EDC shall perform billing and funds collection for each order for which a successful Order Completion Notification is received from ECS.
EDC-			ECS and EDC shall have the capability to process a

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| 0250 | | | maximum of 100 Landsat-7 Level 0R fixed scenes per day. |

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Appendix B. Metadata for 1 KM Resolution Ancillary DEM Data

This Appendix contains a list of metadata attributes for the 1-km (30 arc second) data files. The listing is for the data file. The metadata is the same for the second file, containing standard deviation data, as described in Section 3.4. The only difference between the two sets is the value in the CollectionDescriptionClass Object. In the value in the first file is: Value = "DEM_1KM". The value in the second is Value = "DEM_1KMS".

```
/*----------------------------------------------------------------*/
/* ESDTDescriptor: DEM_1KM        */
/*                                */
/* Metadata Coverage: intermediate */
/*----------------------------------------------------------------*/
  GROUP = INVENTORYMETADATA
    GROUPTYPE = MASTERGROUP
    GROUP = ECSDataGranule
      OBJECT = SizeMBECSDataGranule
        Data_Location = "DSS"
        NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "FALSE"
      END_OBJECT = SizeMBECSDataGranule
      OBJECT = ProductionDateTime
        Data_Location = "TK"
        NUM_VAL = 1
        TYPE = "DATETIME"
        Mandatory = "TRUE"
      END_OBJECT = ProductionDateTime
    END_GROUP = ECSDataGranule
    GROUP = CollectionDescriptionClass
      OBJECT = ShortName
        Data_Location = "MCF"
        NUM_VAL = 1
        TYPE = "STRING"
        Mandatory = "TRUE"
        Value = "DEM_1KM"
      END_OBJECT = ShortName
      OBJECT = VersionID
        Data_Location = "MCF"
        NUM_VAL = 1
        TYPE = "STRING"
        Mandatory = "TRUE"
        Value = "1"
      END_OBJECT = VersionID
    END_GROUP = CollectionDescriptionClass
    GROUP = SpatialDomainContainer
      GROUP = HorizontalSpatialDomainContainer
        GROUP = BoundingRectangle
          OBJECT = WestBoundingCoordinate
```

```
         Data_Location = "PGE"
          NUM_VAL = 1
          TYPE = "DOUBLE"
          Mandatory = "TRUE"
          VALIDRULE = "Range(-180.0,+180.0)"
        END_OBJECT = WestBoundingCoordinate
        OBJECT = NorthBoundingCoordinate
          Data_Location = "PGE"
          NUM_VAL = 1
          TYPE = "DOUBLE"
          Mandatory = "TRUE"
          VALIDRULE = "Range(-90.0,+90.0)"
        END_OBJECT = NorthBoundingCoordinate
        OBJECT = EastBoundingCoordinate
          Data_Location = "PGE"
          NUM_VAL = 1
          TYPE = "DOUBLE"
          Mandatory = "TRUE"
          VALIDRULE = "Range(-180.0,+180.0)"
        END_OBJECT = EastBoundingCoordinate
        OBJECT = SouthBoundingCoordinate
          Data_Location = "PGE"
          NUM_VAL = 1
          TYPE = "DOUBLE"
          Mandatory = "TRUE"
          VALIDRULE = "Range(-90.0,+90.0)"
        END_OBJECT = SouthBoundingCoordinate
      END_GROUP = BoundingRectangle
    END_GROUP = HorizontalSpatialDomainContainer
  END_GROUP = SpatialDomainContainer
  GROUP = RangeDateTime
    OBJECT = RangeBeginningDate
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "DATE"
      Mandatory = "TRUE"
    END_OBJECT = RangeBeginningDate
    OBJECT = RangeBeginningTime
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "TIME"
      Mandatory = "TRUE"
    END_OBJECT = RangeBeginningTime
    OBJECT = RangeEndingDate
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "DATE"
      Mandatory = "TRUE"
    END_OBJECT = RangeEndingDate
    OBJECT = RangeEndingTime
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "TIME"
      Mandatory = "TRUE"
    END_OBJECT = RangeEndingTime
  END_GROUP = RangeDateTime
END_GROUP = INVENTORYMETADATA
```

```
/*Non-searchable metadata*/
/*Basically a dump of metadata that accompanied each DEM binary file. */
/*Some of this is redundant to both the Collection and Core metadata
levels.*/
/*But, this is needed by the DEM tools to access metadata through the tool */
/*PGS_DEM_GetMetadata. */

        GROUP = ARCHIVEDMETADATA
        GROUPTYPE = MASTERGROUP
        GROUP = PROJECTION_INFO
          OBJECT = Projection
            Data_Location              = "MCF"
            NUM_VAL                    = 1
            Value                      = "GEOGRAPHIC"
            Mandatory                  = "FALSE"
            Type                       = "STRING"
          END_OBJECT = Projection
          OBJECT = Datum
            Data_Location              = "PGE"
            NUM_VAL                    = 1
            Mandatory                  = "FALSE"
            Type                       = "STRING"
          END_OBJECT = Datum
          OBJECT = ZUnits
            Data_Location              = "MCF"
            NUM_VAL                    = 1
            Value                      = "METERS"
            Mandatory                  = "FALSE"
            Type                       = "STRING"
          END_OBJECT = ZUNITS
          OBJECT = Units
            Data_Location              = "MCF"
            NUM_VAL                    = 1
            Value                      = "Decimal Degree (DD)"
            Mandatory                  = "FALSE"
            Type                       = "STRING"
          END_OBJECT = Units
          OBJECT = Spheroid
            Data_Location              = "PGE"
            NUM_VAL                    = 1
            Mandatory                  = "FALSE"
            Type                       = "STRING"
          END_OBJECT = Spheroid
          OBJECT = Xshift
            Data_Location              = "MCF"
            NUM_VAL                    = 1
            Value                      = 0.0000000000
            Mandatory                  = "FALSE"
            Type                       = "DOUBLE"
          END_OBJECT = Xshift
          OBJECT = Yshift
            Data_Location              = "MCF"
            NUM_VAL                    = 1
            Value                      = 0.0000000000
            Mandatory                  = "FALSE"
            Type                       = "DOUBLE"
```

```
    END_OBJECT = Yshift
      OBJECT = Parameters
      Data_Location                 = "MCF"
      NUM_VAL                       = 1
      Value                         = 0.0000000000
      Mandatory                     = "FALSE"
      Type                          = "DOUBLE"
    END_OBJECT = Parameters
END_GROUP = PROJECTION_INFO
GROUP = STATISTICS_INFO
  OBJECT = MinimumValue
      Data_Location                 = "PGE"
      NUM_VAL                       = 1
      Mandatory                     = "FALSE"
      Type                          = "INTEGER"
  END_OBJECT = MinimumValue
  OBJECT = MaximumValue
      Data_Location                 = "PGE"
      NUM_VAL                       = 1
      Mandatory                     = "FALSE"
      Type                          = "INTEGER"
  END_OBJECT = MaximumValue
  OBJECT = MeanValue
      Data_Location                 = "PGE"
      NUM_VAL                       = 1
      Mandatory                     = "FALSE"
      Type                          = "DOUBLE"
  END_OBJECT = MeanValue
  OBJECT                            = StandardDeviation
      Data_Location                 = "PGE"
      NUM_VAL                       = 1
      Mandatory                     = "FALSE"
      Type                          = "DOUBLE"
  END_OBJECT = StandardDeviation
END_GROUP = STATISTICS_INFO
GROUP = HEADER_INFO
  OBJECT = ByteOrder
      Data_Location                 = "MCF"
      NUM_VAL                       = 1
      Value                         = "Motorola (high order byte first)"
      Mandatory                     = "FALSE"
      Type                          = "STRING"
  END_OBJECT           = ByteOrder
  OBJECT = BandLayout
      Data_Location                 = "MCF"
      NUM_VAL                       = 1
      Value                         = "Band Interleaved by Line (BIL)"
      Mandatory                     = "FALSE"
      Type                          = "STRING"
  END_OBJECT = BandLayout
  OBJECT = NumberRows
      Data_Location                 = "MCF"
      NUM_VAL                       = 1
      Value                         = 10800
      Mandatory                     = "FALSE"
      Type                          = "INTEGER"
  END_OBJECT = NumberRows
```

```
 OBJECT = NumberColumns
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 14400
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = NumberColumns
 OBJECT = NumberBands
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 1
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = NumberBands
 OBJECT = BitsPerPixel
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 16
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = BitsPerPixel
 OBJECT = BandRowBytes
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 28800
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = BandRowBytes
 OBJECT = TotalRowBytes
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 28800
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = TotalRowBytes
 OBJECT = BandGapBytes
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 0
   Mandatory                         = "FALSE"
   Type                              = "INTEGER"
 END_OBJECT = BandGapBytes
 OBJECT = FillValue
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = -9999.0
   Mandatory                         = "FALSE"
   Type                              = "DOUBLE"
 END_OBJECT = FillValue
 OBJECT = Offset
   Data_Location                     = "MCF"
   NUM_VAL                           = 1
   Value                             = 0.0
   Mandatory                         = "FALSE"
   Type                              = "DOUBLE"
 END_OBJECT = Offset
 OBJECT = Scaling
```

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```
      Data_Location                   = "MCF"
      NUM_VAL                          = 1
      Value                            = 1.0
      Mandatory                        = "FALSE"
      Type                             = "DOUBLE"
    END_OBJECT = Scaling
    OBJECT = UpperLeftXMap
      Data_Location                    = "PGE"
      NUM_VAL                          = 1
      Mandatory                        = "FALSE"
      Type                             = "DOUBLE"
    END_OBJECT = UpperLeftXMap
    OBJECT = UpperLeftYMap
      Data_Location                    = "PGE"
      NUM_VAL                          = 1
      Mandatory                        = "FALSE"
      Type                             = "DOUBLE"
    END_OBJECT = UpperLeftYMap
    OBJECT = XSizePixel
      Data_Location                    = "MCF"
      NUM_VAL                          = 1
      Value                            = .00833333333333
      Mandatory                        = "FALSE"
      Type                             = "DOUBLE"
    END_OBJECT = XSizePixel
    OBJECT = YSizePixel
      Data_Location                    = "MCF"
      NUM_VAL                          = 1
      Value                            = .00833333333333
      Mandatory                        = "FALSE"
      Type                             = "DOUBLE"
    END_OBJECT = YSizePixel
  END_GROUP = HEADER_INFO
  END_GROUP = ARCHIVEDMETADATA
END
```

Appendix C. Metadata for 100 M Resolution Ancillary DEM Data

This Appendix contains a list of metadata attributes for the 100-m (3 arc second) data files. The listing is for the data file. The metadata is the same for the second file, containing standard deviation data, as described in Section 3.4. The only difference between the two sets is the value in the CollectionDescriptionClass Object. In the value in the first file is: Value = "DEM_100M". The value in the second is Value = "DEM_100MS ".

```
/*-------------------------------------------------------------------------*/
/* ESDTDescriptor: DEM_100M          */
/*                                   */
/*Metadata Coverage: full            */
/*-------------------------------------------------------------------------*/
  GROUP = INVENTORYMETADATA
    GROUPTYPE = MASTERGROUP
    GROUP = ECSDataGranule
      OBJECT = SizeMBECSDataGranule
        Data_Location = "DSS"
        NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "FALSE"
      END_OBJECT = SizeMBECSDataGranule
      OBJECT = ProductionDateTime
        Data_Location = "TK"
        NUM_VAL = 1
        TYPE = "DATETIME"
        Mandatory = "TRUE"
      END_OBJECT = ProductionDateTime
    END_GROUP = ECSDataGranule
    GROUP = CollectionDescriptionClass
      OBJECT = ShortName
        Data_Location = "MCF"
        NUM_VAL = 1
        TYPE = "STRING"
        Mandatory = "TRUE"
        Value = "DEM_100M"
      END_OBJECT = ShortName
      OBJECT = VersionID
        Data_Location = "MCF"
        NUM_VAL = 1
        TYPE = "STRING"
        Mandatory = "TRUE"
        Value = "1"
      END_OBJECT = VersionID
    END_GROUP = CollectionDescriptionClass
    GROUP = SpatialDomainContainer
      GROUP = HorizontalSpatialDomainContainer
        GROUP = BoundingRectangle
          OBJECT = WestBoundingCoordinate
            Data_Location = "PGE"
```

```
       NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "TRUE"
        VALIDRULE = "Range(-180.0,+180.0)"
      END_OBJECT = WestBoundingCoordinate
      OBJECT = NorthBoundingCoordinate
        Data_Location = "PGE"
        NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "TRUE"
        VALIDRULE = "Range(-90.0,+90.0)"
      END_OBJECT = NorthBoundingCoordinate
      OBJECT = EastBoundingCoordinate
        Data_Location = "PGE"
        NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "TRUE"
        VALIDRULE = "Range(-180.0,+180.0)"
      END_OBJECT = EastBoundingCoordinate
      OBJECT = SouthBoundingCoordinate
        Data_Location = "PGE"
        NUM_VAL = 1
        TYPE = "DOUBLE"
        Mandatory = "TRUE"
        VALIDRULE = "Range(-90.0,+90.0)"
      END_OBJECT = SouthBoundingCoordinate
    END_GROUP = BoundingRectangle
   END_GROUP = HorizontalSpatialDomainContainer
  END_GROUP = SpatialDomainContainer
  GROUP = RangeDateTime
    OBJECT = RangeBeginningDate
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "DATE"
      Mandatory = "TRUE"
    END_OBJECT = RangeBeginningDate
    OBJECT = RangeBeginningTime
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "TIME"
      Mandatory = "TRUE"
    END_OBJECT = RangeBeginningTime
    OBJECT = RangeEndingDate
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "DATE"
      Mandatory = "TRUE"
    END_OBJECT = RangeEndingDate
    OBJECT = RangeEndingTime
      Data_Location = "PGE"
      NUM_VAL = 1
      TYPE = "TIME"
      Mandatory = "TRUE"
    END_OBJECT = RangeEndingTime
  END_GROUP = RangeDateTime
END_GROUP = INVENTORYMETADATA
```

```
/*Non-searchable metadata*/
/*Basically a dump of metadata that accompanied each DEM binary file. */
/*Some of this is redundant to both the Collection and Core metadata
levels.*/
/*But, this is needed by the DEM tools to access metadata through the tool */
/*PGS_DEM_GetMetadata. */
/*presently there are 6 layers: Elevation, LandWater, Slope, Aspect, */
/*StdDevElevation, and StdDevSlope. */
/*The layer LandWater does not have archive metadata. */
/* In the following INFOCONTAINERs */
/* CLASS 1 is for  Elevation */
/* CLASS 2 is for  Slope */
/* CLASS 3 is for  Aspec */
/* CLASS 4 is for  StdDevElevation */
/* CLASS 5 is for  StdDevSlope */

        GROUP = ARCHIVEDMETADATA
        GROUPTYPE = MASTERGROUP
        GROUP = PROJECTION_INFO
            OBJECT = PROJECTION_INFOCONTAINER1
            CLASS             = "1"
            Data_Location   = "NONE"
            Mandatory       = "FALSE"
          OBJECT = Projection
            Data_Location                = "MCF"
                CLASS            = "1"
            NUM_VAL                      = 1
            Value                        = "GEOGRAPHIC"
            Mandatory                    = "FALSE"
            Type                         = "STRING"
          END_OBJECT = Projection
          OBJECT = Datum
            Data_Location                = "PGE"
                CLASS            = "1"
            NUM_VAL                      = 1
            Mandatory                    = "FALSE"
            Type                         = "STRING"
          END_OBJECT = Datum
          OBJECT = ZUnits
            Data_Location                = "MCF"
                CLASS            = "1"
            NUM_VAL                      = 1
            Value                        = "METERS"
            Mandatory                    = "FALSE"
            Type                         = "STRING"
          END_OBJECT = ZUNITS
          OBJECT = Units
            Data_Location                = "MCF"
                CLASS            = "1"
            NUM_VAL                      = 1
            Value                        = "Decimal Degree (DD)"
            Mandatory                    = "FALSE"
            Type                         = "STRING"
          END_OBJECT = Units
          OBJECT = Spheroid
            Data_Location                = "PGE"
                CLASS            = "1"
```

```
 NUM_VAL                           = 1
  Mandatory                         = "FALSE"
  Type                              = "STRING"
END_OBJECT = Spheroid
OBJECT = Xshift
  Data_Location                     = "MCF"
        CLASS                 = "1"
  NUM_VAL                           = 1
  Value                             = 0.0000000000
  Mandatory                         = "FALSE"
  Type                              = "DOUBLE"
END_OBJECT = Xshift
OBJECT = Yshift
  Data_Location                     = "MCF"
        CLASS                 = "1"
  NUM_VAL                           = 1
  Value                             = 0.0000000000
  Mandatory                         = "FALSE"
  Type                              = "DOUBLE"
END_OBJECT = Yshift
  OBJECT = Parameters
  Data_Location                     = "MCF"
        CLASS                 = "1"
  NUM_VAL                           = 1
  Value                             = 0.0000000000
  Mandatory                         = "FALSE"
  Type                              = "DOUBLE"
END_OBJECT = Parameters
    END_OBJECT = PROJECTION_INFOCONTAINER1
    OBJECT = PROJECTION_INFOCONTAINER2
    CLASS           = "2"
   Data_Location   = "NONE"
   Mandatory       = "FALSE"
OBJECT = Projection
  Data_Location                     = "MCF"
        CLASS                 = "2"
  NUM_VAL                           = 1
  Value                             = "GEOGRAPHIC"
  Mandatory                         = "FALSE"
  Type                              = "STRING"
END_OBJECT = Projection
OBJECT = Datum
  Data_Location                     = "PGE"
        CLASS                 = "2"
  NUM_VAL                           = 1
  Mandatory                         = "FALSE"
  Type                              = "STRING"
END_OBJECT = Datum
OBJECT = ZUnits
  Data_Location                     = "MCF"
        CLASS                 = "2"
  NUM_VAL                           = 1
  Value                             = "DEGREES"
  Mandatory                         = "FALSE"
  Type                              = "STRING"
END_OBJECT = ZUNITS
OBJECT = Units
```

```
   Data_Location              = "MCF"
         CLASS          = "2"
  NUM_VAL                      = 1
  Value                        = "Decimal Degree (DD)"
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Units
OBJECT = Spheroid
  Data_Location              = "PGE"
         CLASS          = "2"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Spheroid
OBJECT = Xshift
  Data_Location              = "MCF"
         CLASS          = "2"
  NUM_VAL                      = 1
  Value                        = 0.0000000000
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Xshift
OBJECT = Yshift
  Data_Location              = "MCF"
         CLASS          = "2"
  NUM_VAL                      = 1
  Value                        = 0.0000000000
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Yshift
  OBJECT = Parameters
  Data_Location              = "MCF"
         CLASS          = "2"
  NUM_VAL                      = 1
  Value                        = 0.0000000000
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Parameters
   END_OBJECT = PROJECTION_INFOCONTAINER2
   OBJECT = PROJECTION_INFOCONTAINER3
   CLASS            = "3"
   Data_Location   = "NONE"
   Mandatory       = "FALSE"
OBJECT = Projection
  Data_Location              = "MCF"
         CLASS          = "3"
  NUM_VAL                      = 1
  Value                        = "GEOGRAPHIC"
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Projection
OBJECT = Datum
  Data_Location              = "PGE"
         CLASS          = "3"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "STRING"
```

```
 END_OBJECT = Datum
OBJECT = ZUnits
  Data_Location                    = "MCF"
         CLASS                = "3"
  NUM_VAL                          = 1
  Value                            = "DEGREES"
  Mandatory                        = "FALSE"
  Type                             = "STRING"
END_OBJECT = ZUNITS
OBJECT = Units
  Data_Location                    = "MCF"
         CLASS                = "3"
  NUM_VAL                          = 1
  Value                            = "Decimal Degree (DD)"
  Mandatory                        = "FALSE"
  Type                             = "STRING"
END_OBJECT = Units
OBJECT = Spheroid
  Data_Location                    = "PGE"
         CLASS                = "3"
  NUM_VAL                          = 1
  Mandatory                        = "FALSE"
  Type                             = "STRING"
END_OBJECT = Spheroid
OBJECT = Xshift
  Data_Location                    = "MCF"
         CLASS                = "3"
  NUM_VAL                          = 1
  Value                            = 0.0000000000
  Mandatory                        = "FALSE"
  Type                             = "DOUBLE"
END_OBJECT = Xshift
OBJECT = Yshift
  Data_Location                    = "MCF"
         CLASS                = "3"
  NUM_VAL                          = 1
  Value                            = 0.0000000000
  Mandatory                        = "FALSE"
  Type                             = "DOUBLE"
END_OBJECT = Yshift
  OBJECT = Parameters
  Data_Location                    = "MCF"
         CLASS                = "3"
  NUM_VAL                          = 1
  Value                            = 0.0000000000
  Mandatory                        = "FALSE"
  Type                             = "DOUBLE"
END_OBJECT = Parameters
    END_OBJECT = PROJECTION_INFOCONTAINER3
    OBJECT = PROJECTION_INFOCONTAINER4
    CLASS            = "4"
    Data_Location    = "NONE"
    Mandatory        = "FALSE"
OBJECT = Projection
  Data_Location                    = "MCF"
         CLASS                = "4"
  NUM_VAL                          = 1
```

```
       Value                            = "GEOGRAPHIC"
       Mandatory                        = "FALSE"
       Type                             = "STRING"
END_OBJECT = Projection
OBJECT = Datum
   Data_Location                        = "PGE"
          CLASS               = "4"
       NUM_VAL                          = 1
       Mandatory                        = "FALSE"
       Type                             = "STRING"
END_OBJECT = Datum
OBJECT = ZUnits
   Data_Location                        = "MCF"
          CLASS               = "4"
       NUM_VAL                          = 1
       Value                            = "METERS"
       Mandatory                        = "FALSE"
       Type                             = "STRING"
END_OBJECT = ZUNITS
OBJECT = Units
   Data_Location                        = "MCF"
          CLASS               = "4"
       NUM_VAL                          = 1
       Value                            = "Decimal Degree (DD)"
       Mandatory                        = "FALSE"
       Type                             = "STRING"
END_OBJECT = Units
OBJECT = Spheroid
   Data_Location                        = "PGE"
          CLASS               = "4"
       NUM_VAL                          = 1
       Mandatory                        = "FALSE"
       Type                             = "STRING"
END_OBJECT = Spheroid
OBJECT = Xshift
   Data_Location                        = "MCF"
          CLASS               = "4"
       NUM_VAL                          = 1
       Value                            = 0.0000000000
       Mandatory                        = "FALSE"
       Type                             = "DOUBLE"
END_OBJECT = Xshift
OBJECT = Yshift
   Data_Location                        = "MCF"
          CLASS               = "4"
       NUM_VAL                          = 1
       Value                            = 0.0000000000
       Mandatory                        = "FALSE"
       Type                             = "DOUBLE"
END_OBJECT = Yshift
  OBJECT = Parameters
   Data_Location                        = "MCF"
          CLASS               = "4"
       NUM_VAL                          = 1
       Value                            = 0.0000000000
       Mandatory                        = "FALSE"
       Type                             = "DOUBLE"
```

```
 END_OBJECT = Parameters
   END_OBJECT = PROJECTION_INFOCONTAINER4
   OBJECT = PROJECTION_INFOCONTAINER5
   CLASS            = "5"
   Data_Location  = "NONE"
   Mandatory      = "FALSE"
OBJECT = Projection
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                = 1
  Value                        = "GEOGRAPHIC"
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Projection
OBJECT = Datum
  Data_Location                = "PGE"
        CLASS          = "5"
  NUM_VAL                = 1
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Datum
OBJECT = ZUnits
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                = 1
  Value                        = "DEGREES"
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = ZUNITS
OBJECT = Units
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                = 1
  Value                        = "Decimal Degree (DD)"
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Units
OBJECT = Spheroid
  Data_Location                = "PGE"
        CLASS          = "5"
  NUM_VAL                = 1
  Mandatory                    = "FALSE"
  Type                         = "STRING"
END_OBJECT = Spheroid
OBJECT = Xshift
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                = 1
  Value                        = 0.0000000000
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Xshift
OBJECT = Yshift
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                = 1
  Value                        = 0.0000000000
```

```
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Yshift
  OBJECT = Parameters
  Data_Location                = "MCF"
        CLASS          = "5"
  NUM_VAL                      = 1
  Value                        = 0.0000000000
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Parameters
    END_OBJECT = PROJECTION_INFOCONTAINER5
END_GROUP = PROJECTION_INFO
GROUP = STATISTICS_INFO
    OBJECT = STATISTICS_INFOCONTAINER1
    CLASS            = "1"
    Data_Location   = "NONE"
    Mandatory       = "FALSE"
  OBJECT = MinimumValue
  Data_Location                = "PGE"
        CLASS          = "1"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MinimumValue
  OBJECT = MaximumValue
  Data_Location                = "PGE"
        CLASS          = "1"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MaximumValue
  OBJECT = MeanValue
  Data_Location                = "PGE"
        CLASS          = "1"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = MeanValue
  OBJECT                       = StandardDeviation
  Data_Location                = "PGE"
        CLASS          = "1"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = StandardDeviation
    END_OBJECT = STATISTICS_INFOCONTAINER1
    OBJECT = STATISTICS_INFOCONTAINER2
    CLASS            = "2"
    Data_Location   = "NONE"
    Mandatory       = "FALSE"
  OBJECT = MinimumValue
  Data_Location                = "PGE"
        CLASS          = "2"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
```

```
 END_OBJECT = MinimumValue
OBJECT = MaximumValue
  Data_Location                 = "PGE"
        CLASS           = "2"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "INTEGER"
END_OBJECT = MaximumValue
OBJECT = MeanValue
  Data_Location                 = "PGE"
        CLASS           = "2"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "DOUBLE"
END_OBJECT = MeanValue
OBJECT                          = StandardDeviation
  Data_Location                 = "PGE"
        CLASS           = "2"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "DOUBLE"
END_OBJECT = StandardDeviation
   END_OBJECT = STATISTICS_INFOCONTAINER2
   OBJECT = STATISTICS_INFOCONTAINER3
   CLASS            = "3"
   Data_Location   = "NONE"
   Mandatory       = "FALSE"
OBJECT = MinimumValue
  Data_Location                 = "PGE"
        CLASS           = "3"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "INTEGER"
END_OBJECT = MinimumValue
OBJECT = MaximumValue
  Data_Location                 = "PGE"
        CLASS           = "3"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "INTEGER"
END_OBJECT = MaximumValue
OBJECT = MeanValue
  Data_Location                 = "PGE"
        CLASS           = "3"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "DOUBLE"
END_OBJECT = MeanValue
OBJECT                          = StandardDeviation
  Data_Location                 = "PGE"
        CLASS           = "3"
  NUM_VAL                       = 1
  Mandatory                     = "FALSE"
  Type                          = "DOUBLE"
END_OBJECT = StandardDeviation
   END_OBJECT = STATISTICS_INFOCONTAINER3
   OBJECT = STATISTICS_INFOCONTAINER4
```

```
 CLASS              = "4"
  Data_Location  = "NONE"
  Mandatory      = "FALSE"
OBJECT = MinimumValue
  Data_Location                = "PGE"
        CLASS              = "4"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MinimumValue
OBJECT = MaximumValue
  Data_Location                = "PGE"
        CLASS              = "4"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MaximumValue
OBJECT = MeanValue
  Data_Location                = "PGE"
        CLASS              = "4"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = MeanValue
OBJECT                         = StandardDeviation
  Data_Location                = "PGE"
        CLASS              = "4"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = StandardDeviation
    END_OBJECT = STATISTICS_INFOCONTAINER4
    OBJECT = STATISTICS_INFOCONTAINER5
    CLASS              = "5"
    Data_Location  = "NONE"
    Mandatory      = "FALSE"
OBJECT = MinimumValue
  Data_Location                = "PGE"
        CLASS              = "5"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MinimumValue
OBJECT = MaximumValue
  Data_Location                = "PGE"
        CLASS              = "5"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = MaximumValue
OBJECT = MeanValue
  Data_Location                = "PGE"
        CLASS              = "5"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = MeanValue
```

```
     OBJECT                              = StandardDeviation
       Data_Location           = "PGE"
           CLASS            = "5"
       NUM_VAL                    = 1
       Mandatory                  = "FALSE"
       Type                       = "DOUBLE"
     END_OBJECT = StandardDeviation
       END_OBJECT = STATISTICS_INFOCONTAINER5
END_GROUP = STATISTICS_INFO
GROUP = HEADER_INFO
       OBJECT = HEADER_INFOCONTAINER1
       CLASS           = "1"
       Data_Location   = "NONE"
       Mandatory       = "FALSE"
     OBJECT = ByteOrder
       Data_Location              = "MCF"
           CLASS            = "1"
       NUM_VAL                    = 1
       Value                      = "Motorola (high order byte first)"
       Mandatory                  = "FALSE"
       Type                       = "STRING"
     END_OBJECT           = ByteOrder
     OBJECT = BandLayout
       Data_Location              = "MCF"
           CLASS            = "1"
       NUM_VAL                    = 1
       Value                      = "Band Interleaved by Line (BIL)"
       Mandatory                  = "FALSE"
       Type                       = "STRING"
     END_OBJECT = BandLayout
     OBJECT = NumberRows
       Data_Location              = "MCF"
           CLASS            = "1"
       NUM_VAL                    = 1
       Value                      = 12000
       Mandatory                  = "FALSE"
       Type                       = "INTEGER"
     END_OBJECT = NumberRows
     OBJECT = NumberColumns
       Data_Location              = "MCF"
           CLASS            = "1"
       NUM_VAL                    = 1
       Value                      = 12000
       Mandatory                  = "FALSE"
       Type                       = "INTEGER"
     END_OBJECT = NumberColumns
     OBJECT = NumberBands
       Data_Location              = "MCF"
           CLASS            = "1"
       NUM_VAL                    = 1
       Value                      = 1
       Mandatory                  = "FALSE"
       Type                       = "INTEGER"
     END_OBJECT = NumberBands
     OBJECT = BitsPerPixel
       Data_Location              = "MCF"
           CLASS            = "1"
```

```
     NUM_VAL                        = 1
     Value                          = 16
     Mandatory                      = "FALSE"
     Type                           = "INTEGER"
END_OBJECT = BitsPerPixel
OBJECT = BandRowBytes
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = 24000
     Mandatory                      = "FALSE"
     Type                           = "INTEGER"
END_OBJECT = BandRowBytes
OBJECT = TotalRowBytes
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = 24000
     Mandatory                      = "FALSE"
     Type                           = "INTEGER"
END_OBJECT = TotalRowBytes
OBJECT = BandGapBytes
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = 0
     Mandatory                      = "FALSE"
     Type                           = "INTEGER"
END_OBJECT = BandGapBytes
OBJECT = FillValue
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = -9999.0
     Mandatory                      = "FALSE"
     Type                           = "DOUBLE"
END_OBJECT = FillValue
OBJECT = Offset
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = 0.0
     Mandatory                      = "FALSE"
     Type                           = "DOUBLE"
END_OBJECT = Offset
OBJECT = Scaling
     Data_Location                  = "MCF"
          CLASS                = "1"
     NUM_VAL                        = 1
     Value                          = 1.0
     Mandatory                      = "FALSE"
     Type                           = "DOUBLE"
END_OBJECT = Scaling
OBJECT = UpperLeftXMap
     Data_Location                  = "PGE"
          CLASS                = "1"
     NUM_VAL                        = 1
```

```
 Mandatory                          = "FALSE"
 Type                               = "DOUBLE"
END_OBJECT = UpperLeftXMap
OBJECT = UpperLeftYMap
 Data_Location                      = "PGE"
        CLASS              = "1"
 NUM_VAL                            = 1
 Mandatory                          = "FALSE"
 Type                               = "DOUBLE"
END_OBJECT = UpperLeftYMap
OBJECT = XSizePixel
 Data_Location                      = "MCF"
        CLASS              = "1"
 NUM_VAL                            = 1
 Value                              = .000833333333333
 Mandatory                          = "FALSE"
 Type                               = "DOUBLE"
END_OBJECT = XSizePixel
OBJECT = YSizePixel
 Data_Location                      = "MCF"
        CLASS              = "1"
 NUM_VAL                            = 1
 Value                              = .000833333333333
 Mandatory                          = "FALSE"
 Type                               = "DOUBLE"
END_OBJECT = YSizePixel
   END_OBJECT = HEADER_INFOCONTAINER1
   OBJECT = HEADER_INFOCONTAINER2
   CLASS           = "2"
   Data_Location   = "NONE"
   Mandatory       = "FALSE"
OBJECT = ByteOrder
 Data_Location                      = "MCF"
        CLASS              = "2"
 NUM_VAL                            = 1
 Value                              = "Motorola (high order byte first)"
 Mandatory                          = "FALSE"
 Type                               = "STRING"
END_OBJECT           = ByteOrder
OBJECT = BandLayout
 Data_Location                      = "MCF"
        CLASS              = "2"
 NUM_VAL                            = 1
 Value                              = "Band Interleaved by Line (BIL)"
 Mandatory                          = "FALSE"
 Type                               = "STRING"
END_OBJECT = BandLayout
OBJECT = NumberRows
 Data_Location                      = "MCF"
        CLASS              = "2"
 NUM_VAL                            = 1
 Value                              = 12000
 Mandatory                          = "FALSE"
 Type                               = "INTEGER"
END_OBJECT = NumberRows
OBJECT = NumberColumns
 Data_Location                      = "MCF"
```

```
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 12000
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = NumberColumns
OBJECT = NumberBands
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 1
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = NumberBands
OBJECT = BitsPerPixel
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 8
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = BitsPerPixel
OBJECT = BandRowBytes
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 12000
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = BandRowBytes
OBJECT = TotalRowBytes
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 12000
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = TotalRowBytes
OBJECT = BandGapBytes
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = 0
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = BandGapBytes
OBJECT = FillValue
  Data_Location                = "MCF"
          CLASS               = "2"
  NUM_VAL                      = 1
  Value                        = -9999.0
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = FillValue
OBJECT = Offset
  Data_Location                = "MCF"
          CLASS               = "2"
```

```
 NUM_VAL                          = 1
 Value                            = 0.0
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = Offset
OBJECT = Scaling
 Data_Location                    = "MCF"
     CLASS                = "2"
 NUM_VAL                          = 1
 Value                            = 1.0
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = Scaling
OBJECT = UpperLeftXMap
 Data_Location                    = "PGE"
     CLASS                = "2"
 NUM_VAL                          = 1
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = UpperLeftXMap
OBJECT = UpperLeftYMap
 Data_Location                    = "PGE"
     CLASS                = "2"
 NUM_VAL                          = 1
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = UpperLeftYMap
OBJECT = XSizePixel
 Data_Location                    = "MCF"
     CLASS                = "2"
 NUM_VAL                          = 1
 Value                            = .000833333333333
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = XSizePixel
OBJECT = YSizePixel
 Data_Location                    = "MCF"
     CLASS                = "2"
 NUM_VAL                          = 1
 Value                            = .000833333333333
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = YSizePixel
   END_OBJECT = HEADER_INFOCONTAINER2
   OBJECT = HEADER_INFOCONTAINER3
   CLASS            = "3"
   Data_Location   = "NONE"
   Mandatory       = "FALSE"
OBJECT = ByteOrder
 Data_Location                    = "MCF"
     CLASS                = "3"
 NUM_VAL                          = 1
 Value                            = "Motorola (high order byte first)"
 Mandatory                        = "FALSE"
 Type                             = "STRING"
END_OBJECT             = ByteOrder
OBJECT = BandLayout
```

```
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = "Band Interleaved by Line (BIL)"
  Mandatory                           = "FALSE"
  Type                                = "STRING"
END_OBJECT = BandLayout
OBJECT = NumberRows
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 12000
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = NumberRows
OBJECT = NumberColumns
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 12000
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = NumberColumns
OBJECT = NumberBands
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 1
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = NumberBands
OBJECT = BitsPerPixel
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 16
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = BitsPerPixel
OBJECT = BandRowBytes
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 24000
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = BandRowBytes
OBJECT = TotalRowBytes
  Data_Location                      = "MCF"
        CLASS               = "3"
  NUM_VAL                             = 1
  Value                               = 24000
  Mandatory                           = "FALSE"
  Type                                = "INTEGER"
END_OBJECT = TotalRowBytes
OBJECT = BandGapBytes
  Data_Location                      = "MCF"
```

```
          CLASS               = "3"
  NUM_VAL                      = 1
  Value                        = 0
  Mandatory                    = "FALSE"
  Type                         = "INTEGER"
END_OBJECT = BandGapBytes
OBJECT = FillValue
  Data_Location                = "MCF"
          CLASS                = "3"
  NUM_VAL                      = 1
  Value                        = -9999.0
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = FillValue
OBJECT = Offset
  Data_Location                = "MCF"
          CLASS                = "3"
  NUM_VAL                      = 1
  Value                        = 0.0
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Offset
OBJECT = Scaling
  Data_Location                = "MCF"
          CLASS                = "3"
  NUM_VAL                      = 1
  Value                        = 1.0
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = Scaling
OBJECT = UpperLeftXMap
  Data_Location                = "PGE"
          CLASS                = "3"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = UpperLeftXMap
OBJECT = UpperLeftYMap
  Data_Location                = "PGE"
          CLASS                = "3"
  NUM_VAL                      = 1
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = UpperLeftYMap
OBJECT = XSizePixel
  Data_Location                = "MCF"
          CLASS                = "3"
  NUM_VAL                      = 1
  Value                        = .000833333333333
  Mandatory                    = "FALSE"
  Type                         = "DOUBLE"
END_OBJECT = XSizePixel
OBJECT = YSizePixel
  Data_Location                = "MCF"
          CLASS                = "3"
  NUM_VAL                      = 1
  Value                        = .000833333333333
```

```
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = YSizePixel
    END_OBJECT = HEADER_INFOCONTAINER3
    OBJECT = HEADER_INFOCONTAINER4
    CLASS           = "4"
    Data_Location  = "NONE"
    Mandatory      = "FALSE"
OBJECT = ByteOrder
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = "Motorola (high order byte first)"
  Mandatory                       = "FALSE"
  Type                            = "STRING"
END_OBJECT               = ByteOrder
OBJECT = BandLayout
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = "Band Interleaved by Line (BIL)"
  Mandatory                       = "FALSE"
  Type                            = "STRING"
END_OBJECT = BandLayout
OBJECT = NumberRows
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = 12000
  Mandatory                       = "FALSE"
  Type                            = "INTEGER"
END_OBJECT = NumberRows
OBJECT = NumberColumns
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = 12000
  Mandatory                       = "FALSE"
  Type                            = "INTEGER"
END_OBJECT = NumberColumns
OBJECT = NumberBands
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = 1
  Mandatory                       = "FALSE"
  Type                            = "INTEGER"
END_OBJECT = NumberBands
OBJECT = BitsPerPixel
  Data_Location                   = "MCF"
        CLASS            = "4"
  NUM_VAL                         = 1
  Value                           = 16
  Mandatory                       = "FALSE"
  Type                            = "INTEGER"
END_OBJECT = BitsPerPixel
OBJECT = BandRowBytes
```

```
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = 24000
 Mandatory                        = "FALSE"
 Type                             = "INTEGER"
END_OBJECT = BandRowBytes
OBJECT = TotalRowBytes
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = 24000
 Mandatory                        = "FALSE"
 Type                             = "INTEGER"
END_OBJECT = TotalRowBytes
OBJECT = BandGapBytes
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = 0
 Mandatory                        = "FALSE"
 Type                             = "INTEGER"
END_OBJECT = BandGapBytes
OBJECT = FillValue
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = -9999.0
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = FillValue
OBJECT = Offset
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = 0.0
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = Offset
OBJECT = Scaling
 Data_Location                    = "MCF"
        CLASS             = "4"
 NUM_VAL                          = 1
 Value                            = 1.0
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = Scaling
OBJECT = UpperLeftXMap
 Data_Location                    = "PGE"
        CLASS             = "4"
 NUM_VAL                          = 1
 Mandatory                        = "FALSE"
 Type                             = "DOUBLE"
END_OBJECT = UpperLeftXMap
OBJECT = UpperLeftYMap
 Data_Location                    = "PGE"
        CLASS             = "4"
```

```
  NUM_VAL                            = 1
  Mandatory                          = "FALSE"
  Type                               = "DOUBLE"
END_OBJECT = UpperLeftYMap
OBJECT = XSizePixel
  Data_Location                      = "MCF"
        CLASS              = "4"
  NUM_VAL                            = 1
  Value                              = .000833333333333
  Mandatory                          = "FALSE"
  Type                               = "DOUBLE"
END_OBJECT = XSizePixel
OBJECT = YSizePixel
  Data_Location                      = "MCF"
        CLASS              = "4"
  NUM_VAL                            = 1
  Value                              = .000833333333333
  Mandatory                          = "FALSE"
  Type                               = "DOUBLE"
END_OBJECT = YSizePixel
    END_OBJECT = HEADER_INFOCONTAINER4
    OBJECT = HEADER_INFOCONTAINER5
    CLASS            = "5"
    Data_Location   = "NONE"
    Mandatory       = "FALSE"
OBJECT = ByteOrder
  Data_Location                      = "MCF"
        CLASS              = "5"
  NUM_VAL                            = 1
  Value                              = "Motorola (high order byte first)"
  Mandatory                          = "FALSE"
  Type                               = "STRING"
END_OBJECT           = ByteOrder
OBJECT = BandLayout
  Data_Location                      = "MCF"
        CLASS              = "5"
  NUM_VAL                            = 1
  Value                              = "Band Interleaved by Line (BIL)"
  Mandatory                          = "FALSE"
  Type                               = "STRING"
END_OBJECT = BandLayout
OBJECT = NumberRows
  Data_Location                      = "MCF"
        CLASS              = "5"
  NUM_VAL                            = 1
  Value                              = 12000
  Mandatory                          = "FALSE"
  Type                               = "INTEGER"
END_OBJECT = NumberRows
OBJECT = NumberColumns
  Data_Location                      = "MCF"
        CLASS              = "5"
  NUM_VAL                            = 1
  Value                              = 12000
  Mandatory                          = "FALSE"
  Type                               = "INTEGER"
END_OBJECT = NumberColumns
```

```
 OBJECT = NumberBands
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 1
   Mandatory                    = "FALSE"
   Type                         = "INTEGER"
END_OBJECT = NumberBands
OBJECT = BitsPerPixel
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 8
   Mandatory                    = "FALSE"
   Type                         = "INTEGER"
END_OBJECT = BitsPerPixel
OBJECT = BandRowBytes
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 12000
   Mandatory                    = "FALSE"
   Type                         = "INTEGER"
END_OBJECT = BandRowBytes
OBJECT = TotalRowBytes
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 12000
   Mandatory                    = "FALSE"
   Type                         = "INTEGER"
END_OBJECT = TotalRowBytes
OBJECT = BandGapBytes
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 0
   Mandatory                    = "FALSE"
   Type                         = "INTEGER"
END_OBJECT = BandGapBytes
OBJECT = FillValue
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = -9999.0
   Mandatory                    = "FALSE"
   Type                         = "DOUBLE"
END_OBJECT = FillValue
OBJECT = Offset
   Data_Location                = "MCF"
        CLASS               = "5"
   NUM_VAL                      = 1
   Value                        = 0.0
   Mandatory                    = "FALSE"
   Type                         = "DOUBLE"
END_OBJECT = Offset
OBJECT = Scaling
```

```
    Data_Location                   = "MCF"
            CLASS              = "5"
    NUM_VAL                          = 1
    Value                            = 1.0
    Mandatory                        = "FALSE"
    Type                             = "DOUBLE"
  END_OBJECT = Scaling
  OBJECT = UpperLeftXMap
    Data_Location                   = "PGE"
            CLASS              = "5"
    NUM_VAL                          = 1
    Mandatory                        = "FALSE"
    Type                             = "DOUBLE"
  END_OBJECT = UpperLeftXMap
  OBJECT = UpperLeftYMap
    Data_Location                   = "PGE"
            CLASS              = "5"
    NUM_VAL                          = 1
    Mandatory                        = "FALSE"
    Type                             = "DOUBLE"
  END_OBJECT = UpperLeftYMap
  OBJECT = XSizePixel
    Data_Location                   = "MCF"
            CLASS              = "5"
    NUM_VAL                          = 1
    Value                            = .000833333333333
    Mandatory                        = "FALSE"
    Type                             = "DOUBLE"
  END_OBJECT = XSizePixel
  OBJECT = YSizePixel
    Data_Location                   = "MCF"
            CLASS              = "5"
    NUM_VAL                          = 1
    Value                            = .000833333333333
    Mandatory                        = "FALSE"
    Type                             = "DOUBLE"
  END_OBJECT = YSizePixel
     END_OBJECT = HEADER_INFOCONTAINER5
  END_GROUP = HEADER_INFO
  END_GROUP = ARCHIVEDMETADATA
END
```

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Appendix D. EDC Requirements for Landsat-7 Pricing

1.0 Pricing must include WRS scene prices, full sub-interval prices, floating scene prices, band sub-set prices, and different media prices for the various data products.

2.0 All prices must be configurable by the DAAC.

    2.1 The prices may differ by media type (I.e., 8mm tape vs. DLT).

    2.2 The DAAC must be allowed to select the scan line start/stop intervals. No limits should be placed on the number of price steps allowed.

    2.3 Floating scene prices will follow a configurable table structure based on scan lines.

    2.4 The full sub-interval prices will follow a configurable table structure based on scan lines, but different than floating scene.

    2.5 The band subset products will subtract a configurable percent for each band NOT included in the order (this allows PAN band price to be higher).

3.0 Non-image data will be ordered as a unique product and include browse files.

    3.1 Non-image data and associated browse will be distributed for full sub-Interval only.

    3.2 Non-image data pricing will be fixed by media type. (I.e., $50 per sub-interval for 8mm, $100 per sub-interval for DLT, etc.)

4.0 DORRAN will use the price estimate from ECS to charge users.

    4.1 The EST_COST field must be sent from ECS to DORRAN.

    4.2 The floating scene units must have unique identifiers within an individual order (DORRAN requirement). I.e., if more than one unit is ordered from a subinterval, the GRANULE_ID (or PACKAGE_ID) must be unique within that order.

Look Up Table (<u>EXAMPLE ONLY</u>):
Single Scene Product = 375 Scan Lines
2-Scene Product = 710
3-Scene Product = 1045
4-Scene Product = …

Scan_Line_Start	Scan_Line_Stop	Price(L0R)	Price(L1)
0	375	$Base Price L0	$Base Price L1
376	A	$Base + $X	$Base + $D
A	B	$Base + $Y	$Base + $E
B	C	$Base + $Z	$Base + $F

Number_of_Band (Not selected)	Price_Difference	
8	-G%	(G is a configurable percentage)
7	-G%	
6H	-G%	
6L	-G%	
5	-G%	
4	-G%	
3	-G%	
2	-G%	
1	-G%	

Abbreviations and Acronyms

ASCII	American Standard Code for Information Interchange
B	Byte
CCB	Configuration Control Board
CDR	Critical Design Review
CDRL	Contract Data Requirement List
CPF	calibration parameter file
CSMS	Communications and Systems Management Segment
DAAC	Distributed Active Archive Center
DCN	Document Change Notice
DDIST	Data Distribution
DID	Data Item Description
DN	Distribution Notice
DORRAN	Distributed Ordering, Research, Reporting and Accounting Network
ECS	EOSDIS Core System
EDC	EROS Data Center
EDG	EOS Data Gateway
email	electronic mail
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Type
ftp	file transfer protocol
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HDF-EOS	HDF (with) Earth Observing System extensions

I&T	Integration and Test
ICD	Interface Control Document
IP	Internet Protocol
IRD	Interface Requirement Document
ISO	International Standards Organization
IWG	Investigators Working Group
L0R	Level 0R
L1	Level 1
LPDS	Level 1 Product Distribution System
km	kilometer
m	meter
OA	Operations Agreement
ODL	Object Description Language
PCF	Process Control File
PDPS	Planning and Data Processing System
PGE	Product Generation Executive
ps	Postscript [format]
PVL	Parameter Value Language
RFC	Request for Comment
rtf	rich text format
SDP	Science Data Processing
SDPS	Science Data Processing Segment
SDSRV	Science Data Server
tar	UNIX command to archive files. Also, format of files archived by tar
UR	universal reference
URL	Universal Resource Locator